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HEREDITY AND CONSTITUTION IN THE AETIOLOGY OF PSYCHIC DISORDERS*

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The significance of heredity and constitution in psychic diseases is not limited to those groups of mental disorders which, in the narrower sense, are usually termed "hereditary diseases," but reaches far beyond them. Conversely, the diversity of causes in hereditary diseases is by no means exhausted by what we call heredity and constitution.

The Three Main Groups of Psychoses

Let us, to begin with, concentrate on these hereditary diseases in the narrower sense of the term—that is to say, mainly on the three main groups of the manic-depressive, the schizophrenic, and the epileptic diseases. If in these cases we base our investigations only on the psychoses themselves, then the genetical tables will be reminiscent of completion-test texts. We find strong evidence of the workings of heredity; we find psychoses of a similar nature repeatedly cropping up in family trees. But that alone does not suffice to explain why they take their particular position in the tables, why they appear in one place and disappear in another. An essential advance in our knowledge has been due to the fact that these psychoses are not inherited intermittently as an isolated special factor by themselves, but that the relations between the various cases of psychosis in a family can, to a certain extent, become discernible, phenotypically, as variations of the personality. To-day, therefore, we no longer study hereditary diseases merely under the aspect of the relations of psychosis to psychosis, but to an ever-growing extent within the great framework of the psycho-physical constitution as a whole, thus bringing personality and psychosis into close relationship.

We had, first of all, ascertained that subjects who develop schizophrenia, manic-depressive disturbances, or epilepsy have no random psychic make-up. In fact, each of these hereditary diseases develops on the foundation of certain personalities and families of a definite coloration. These families have a larger proportion of personalities of a peculiar shade who, without being ill themselves, do exhibit a biological make-up, both in bodily characteristics and in the finer traits of character and temperament, which approaches the characteristics of personality we find in mental invalids. According to their classification in their respective hereditary diseases we term them schizoid, cycloid, or epileptoid psychopathies. Thus each of these hereditary diseases is surrounded by a sphere of certain specifically characteristic hereditary constitutions and characters. Once these constitutions have been recognized the hereditary diseases no longer appear as chance phenomena. A complicated network of relations is unfolded before us which leads from certain healthy temperaments through certain nervous and psychopathic forms of constitution, and on to the gravest forms of hereditary diseases. Within this network one may regard the hereditary diseases proper as points of utmost concentration of a specifically directed form of degeneration. Thus, lastly, the hereditary diseases do not spring only from the propagation of those afflicted by them, but probably to a far greater extent through the medium of schizoid, cycloid, and epileptoid kin, and through combinations of inheritance. There are two ways of visualizing this genesis: either as a strong accumulation of homogeneous factors, as occurs in inbreeding (for instance, in the single or repeated mating of highly schizoid partners), or by way of an endogenous or exogenous lesion, in itself uncharacteristic, which is added to such a combination, whereupon at this genetic stage the hereditary disease is developed which is appropriate to the constitutional make-up of the particular family—that is to say, in an epileptoid family epilepsy, in a schizoid family schizophrenia, and so on. This latter form of origin is the more probable.

Physique and its Relation to Temperament

With these first principles well established we next proceed to make a more exact study of the forms of human constitution, including healthy subjects. As it happens, one can dispense with the intermediate link of the hereditary diseases altogether, and simply investigate the forms of human physique in direct relation to their psychology and their types of physiological responses. We then discover that the temperaments which we had termed "cyclothyme," after our primary survey of the hereditary manic-depressive disorders, are simply the normal temperaments of people with pyknosomatic physique, whilst the schizothyme temperaments occur in the first place in the leptosomatic types. The temperaments of athleticosomatics actually show some affinity with certain personality types in the epileptic group, to which they contribute a considerable contingent, but a uniform relationship cannot be directly established. Such temperaments can, however, be well differentiated and described in a direct manner in healthy subjects. We have termed the temperaments of the athleticosomatics viscous temperaments. Many smaller physique-groups also have their temperamental characteristics—for instance, the eunuchoid type, the pituitary type, and the infantile type, to whose relation to the hysterical group we shall refer later. The three main normal temperament groups, which have been differentiated in accordance with their physical habitus, lend themselves to direct observation and to methods of investigation by questionary, but especially to the experimental psychological approach. Thus one arrives at certain simple psychological building-stones of the structure of human personality which, for the moment, cannot be further reduced, and which correspond

* One of three lectures given at the Tavistock Clinic in April.

with physique. We call these "radical forms of the personality." We are now working with these radicals, to which we are beginning to reduce the temperamental types and from which, again, the great temperamental groups can be correspondingly built up.

Diagnosis of the Endogenous Psychoses

If we now pass from the general biological approach to the consideration of special psychopathological problems we find that the diagnostics of the endogenous psychoses are beginning to be considerably transformed in the light of these recently acquired additions to our knowledge. However, the three principal types of hereditary psychic disease, the schizophrenic, manic-depressive, and epileptic, are retained as before. In fact they become paradigms of certain fundamental hereditary characteristics in the human personality which obtain equally in the realm of normal biology.

But as soon as we consider clinical diagnostics in particular we find that the three great morbid clinical pictures, in their present very comprehensive form, contain extremely heterogeneous elements. If, for example, a pyknosomatic subject develops a schizophrenia-like psychosis his schizophrenia will on the whole differ essentially from the schizophrenia of a leptosomatic. Usually it will have a differently coloured semeiology, a different age of onset, and a different development and prognosis. The pyknosomatic who happens to trespass into the schizophrenic field usually develops his illness later in life and exhibits more periodic or paranoid forms, which are less destructive to the personality. Further, the prognosis in his case is altogether more favourable. The athleticosomatic, eunuchoid, obese, and other types also exhibit specific varieties of schizophrenia.

In the light of constitutional biology even so simple a picture as that of depression reveals a rich abundance of heterogeneous patterns. When a schizoid personality develops a depressive state then its coloration, its more subtle psychological structure, its accompanying bodily symptoms, tempo, and curve of development, differ so widely from those occurring in a cyclothyme-pyknosomatic subject that one almost shrinks from describing both by the term "depression." In this case, in fact, the common term may serve to obscure rather than illuminate the issue. In any case nowadays one can hardly bring oneself to include a melancholia which is overloaded with schizoid constitutional features in the manic-depressive group if the term "circular," or "manic-depressive," is to retain any true biological meaning.

So when we now study the relation between constitution and hereditary disease we shall no longer—as formerly of necessity—concern ourselves purely statistically with the relative correspondence; for instance, of leptosomatic physique or athleticosomatic physique with schizophrenic, manic-depressive, or epileptic psychosis. As it happens, even these summary statistics, computed from the international material of numerous research workers and covering over 8,000 cases, reveal a clear and positive correlation. But the degree of disparity in the results of the various investigators hardly tends to point to genuine discrepancies in their material, but rather to reveal how many or how few heterogeneous factors bearing on psychosis the various investigators have included in their clinical diagnoses, which may be perfectly correct according to older psychiatric standards.

However, we can now venture to reconstruct the system of hereditary psychic disorders step by step, analysing their finer structure under the aspect of psychophysical constitutional biology. This diagnostic method, which is based on true constitutional biology and which at the same time takes stock of exogenous causal factors, is of course far more complicated. It leads to a larger number of overlapping types and subgroups, but both prognostically and therapeutically it is much more reliable and successful.

This new psychiatric approach to the problem of hereditary mental disorders, which is influenced by constitutional-biological considerations, is of far-reaching significance to pure science, characterology, and clinical diagnosis; it also affects the prognostic and therapeutic aspects of clinical psychiatry. From the point of view of eugenics, in its negative (that is, its eliminatory) aspects, this extension of our knowledge of constitution does not materially affect our fundamental position—namely, that as a rule the carriers of serious hereditary disorders, both in their own interests and in those of society, should have no offspring. This principle holds good whether we choose to classify hereditary diseases under a few main heads (as did Kräpelin), or whether we prefer to differentiate them more thoroughly with the aid of constitutional biology. For more subtle eugenic problems, however, especially when we are called upon to advise both the healthy and those who exhibit psychopathic traits either in their person or their inheritance as to suitable marital partners and the likelihood of their producing healthy stock, our knowledge of constitutional biology cannot be sufficiently thorough and detailed. Great tasks are yet awaiting us in this field, and constitutional biology will be called upon to play a decisive part.

Exogenous Contributory Factors

Our approach is still further widened owing to the fact that in dealing with inherited disorders we need to consider not only inheritance itself (although it is admittedly the chief causal factor, which therefore rightly governs our practical outlook in matters of eugenics), but also the various exogenous contributory causes, which may be reactive, infective, or toxic; endocrine factors must also be borne in mind. For if only 1 per cent. of the total causality is lacking, then the psychosis will not manifest phenotypically; and the subject of morbid inheritance will remain a latent carrier throughout his life. This "multidimensional" approach has its greatest bearings on therapeutics. As clinicians we no longer regard hereditary diseases in individual cases as the working of inexorable fate. If we tackle the contributory causes, such as have been mentioned above, a psychosis often lends itself to cure. These considerations are supported not only by clinical experience but also by theoretical genetics, as, for example, Luxemburger's work on the occurrence of schizophrenia in monozygotic twins, carried out at the Rüdin Institute.

Clinical observation shows us that even so simple a psychiatric picture as depression occurs only in a minority of cases solely as a result of hereditary factors comparable to the ringing of an alarm clock which is mechanically set to go off at a certain time. Even in cases of powerful morbid inheritance many contributory causes are, as a rule, required to bring the depressive predisposition to the surface. There are, for example, certain infectious diseases, such as ordinary influenza, which can activate depression in predisposed subjects. The weather, and ordinary climatic conditions, may give rise to violent shifts of mood; a southern gale can depress persons with certain constitutions to the verge of suicide. There are people who can only live in certain climates, who in other climates are continually subject to depression.

Incidentally, similar phenomena occur in the field of epilepsy. There are epileptoids who develop tropical frenzy on their first oversea trip and who from then onwards exhibit episodic disturbances of consciousness even at home. People with the depressive predisposition are especially susceptible to endocrine fluctuations. The climacteric releases a variety of depressive states; an appropriate endocrine treatment may remove them. Many women become depressed in pregnancy or parturition, and sometimes only in such circumstances. In early cerebral arteriosclerosis many pyknosomatic cyclothymes exhibit depressions which can be counteracted by vascular remedies. Powerful experiences and reactive causes may lead to depressions, especially when they occur coincidently with physically determined depressive factors in a person who is constitutionally predisposed thereto. As the result of this refinement of the analysis of the causal factors in every variety of depression, which we owe to the multidimensional approach, and the consequent attempt to tackle causes therapeutically, the group of depressions which may be regarded as purely endogenous has diminished progressively. Strictly speaking, there is no antinomy and no defined borderline between hereditary and exogenous depressions; actually the various causes overlap to such an extent that one should often speak only of "mainly endogenous" or "mainly reactive" depressions. The evaluation of hereditary factors must, however, be taken into account whenever eugenic as opposed to simple therapeutic issues are involved.

Overlapping of Hereditary and Exogenous Causes

In epilepsy this overlapping of hereditary and exogenous causes is even more in evidence, and the role of severe external insults, such as cerebral trauma or alcohol, in the origin of epileptic fits is uncontested. Besides, reactive factors, psychophysical exhaustion, and endocrine disorders are by no means without importance in certain kinds of epilepsy. Here, again, one must beware of too sharp a distinction between "genuine" and "symptomatic" epilepsy. Even in the genuine cases "multidimensional" release mechanisms can frequently be traced; and, conversely, hereditary factors often contribute to the epilepsy following severe head injuries.

The hereditary factor is probably most important in schizophrenia; but even here Luxemburger's work on monozygotic twins points to the existence of contributory exogenous causal factors, apart from heredity, in about one-fourth of all cases. This aspect of the causal factors becomes far more complicated when we examine the border-zone of schizophrenia—for example, puerperal and infective psychoses with schizophrenic features or, on the psychogenic side, the so-called "schizophrenic reaction type." So far as the psychic causes are concerned it is worth noting that by no means all psychic traumata are equally likely to release psychoses in persons with a schizophrenic make-up. Thus the effect of factors threatening life—fright, fear, strain—is small on schizoid constitutions; otherwise one would have observed an enormous rise in schizophrenia during the war, which was by no means the case. Schizoids are comparatively immune from all these groups of experiences; probably this is in some way connected with their natural disposition towards a stoical attitude to life. On the other hand certain schizoid constitutions are highly susceptible to erotic and ecstatic religious influences. I have occasionally observed the acute onset of katatonia in which the religious note was consistently sounded immediately following revival meetings. Similarly, there exists what one might term "engagement-katatonia," which may follow on intense erotic experiences of an ambivalent nature. It is noteworthy that these two types of experience may not only release acute katatonia but they also still further reveal the deep psychology of many schizophrenics. Both are closely interrelated, so that love thoughts may at a certain degree of intensity suddenly turn into religious ideas, or religious ecstasy may stimulate and inform an erotic experience.

If we consider all these clinical facts in relation to the release of certain psychic-reactive and also toxi-infective cases of schizophrenia we find that they fit in well with the results of genetical research and that the secondary causes, which according to research on twins we must hold responsible for a substantial number of schizophrenic cases, are actually accessible to careful clinical observation.

A twofold task for psychic hygiene follows from these considerations. The first and foremost is to prevent by way of eugenics the inheritance of endogenous psychoses. But where this method fails the psychosis in the life of the hereditarily tainted individual can frequently be prevented from later appearance by prophylaxis; or it can be cured after its appearance if we devote careful study to the variety of the causal factors which, together with inheritance, are responsible for the onset of an unequivocal psychosis.

The Exogenous Psychoses

But if we want to realize the significance of constitution and heredity in its full scope we must turn for a moment to the seemingly opposite end of the scale of the psychic disorders—namely, the *exogenous* psychoses. In such disorders, which can be exemplified by general paralysis and alcoholic psychosis, a non-hereditary, non-constitutional noxa enters the organism from without and is unquestionably the main cause of the illness. Is the inherited constitution negligible in these cases? And can the many variations in the clinical picture and their mode of progress be explained simply by exogenous determinants—for instance, by the existence of different varieties of spirochaete? According to our more recent investigations this is definitely not the case. The hereditary constitution plays a considerable part, too, in disorders that primarily are determined exogenously, not only in the production of semeiological nuances but also by affecting the whole progress of the disease. For general paralysis and puerperal psychosis this fact has been established by my collaborators Westphal and Römer, and for alcoholic psychosis by Pohlisch.

In dealing with the alcoholic psychoses Pohlisch mainly stressed the constitutional differences found in those suffering from delirium tremens and alcoholic hallucinosis. These varying clinical forms are by no means due to different varieties of alcohol; they represent different types, different constitutions, which develop delirium or hallucinosis as the case may be. Among the deliriants no fewer than 55 per cent. were found to be pyknosomatic and 64 per cent. were temperamentally markedly cyclothyme; only 1.8 per cent. showed asthenic physique, and only 3 per cent. were temperamentally schizothyme. With hallucinosis the ratio was reversed: schizoid temperaments were clearly predominant (almost three-fourths of all causes). Correspondingly, the delirium tremens series contained many socially well-adapted, efficient individuals without personal or hereditary character defects. Patients suffering from alcoholic hallucinosis, on the other hand, were frequently of the unstable, asocial, and nervous type—not far removed from schizophrenics.

Similarly it is probable that the alcoholic disorders which occur in persons with the epileptoid constitution could be shown to link up with epileptic psychosis proper.

It is important to realize in this connexion that the constitutional factor in the exogenous psychosis does not merely effect a slight variation of the symptomatic picture in accordance with the patient's personal peculiarities—this would follow as a matter of course—but that it is an essential determining factor in the very structure of the psychosis, a factor which does not merely colour the symptomatic picture but which determines the whole course and termination of the disease. The psychological reasons for taking to drink vary in accordance with a person's constitution; the alcoholic disorder with which he is faced is correspondingly different, and the prognosis is different. These considerations also affect our approach to the biological and eugenic aspects of alcoholism. Since, according to Pohlisch, alcoholic delirium, in contrast to the other alcoholic psychoses, seldom occurs as a familial disorder and frequently crops up in constitutionally healthy individuals, it should be regarded as of less serious import than the other psychoses when we are called upon to advise in matrimonial problems.

Influence of the Constitution

Constitution plays no less important a part in the determination of the reactive neuropsychoses, psychogenic conditions, psychoneuroses, hysteria, obsessional neurosis, and paranoid states. Although we are frequently able to cure them by psychotherapy we must never forget that successful psychotherapy just as often depends on problems of personality-structure as on experience and environment. The structure of personality is in its essence constitutional and inherited. In our treatment we exert a formative influence on it. Often external experience is not so much the real cause of a neurosis; it is rather a flame which ignites the inner typologically determined mass of conflicts within the personality. Practical psychotherapy has shown us that in the origin of the neuroses definite constitutional elements play a part—for instance, minor developmental arrests, especially those occurring during puberty and in the immediate post-pubertal period.

In hysteria, for example, the constitutional predisposition is by no means limited to what is generally termed "nervousness." Certainly all hysterics exhibit autonomic nervous anomalies; their reflex and semi-reflex reactions are highly labile and are easily deflected. But this is not the whole story so far as the specific hysterical predisposition is concerned: there are innumerable people with a labile autonomic nervous system, but few necessarily consult a doctor, and among them only a small number are hysterics.

Furthermore, in hysterics our methods of investigation reveal a mass of minute constitutional sexual anomalies which, if we regard the personality in cross-section as it were, appear as stigmata at the level of physique and character. These anomalies are perhaps even more conspicuous if we regard the personality, so to speak, lengthwise—that is, as a life curve—when they become clearly apparent as developmental checks and uneven rhythms in the pubertal and post-pubertal periods. It is these anomalies which form the other half of the constitutional predisposition to hysteria mentioned above. It is noteworthy, however, that extreme degrees of developmental arrests such as are associated with endocrine disorders and generalized infantilism do not as a rule give rise to hysteria; the more usual resultant picture is one of more generalized psychological inferiority uncomplicated by psychic conflicts. However, it is these *partial* "infantilisms" and "juvenilisms" which give rise to endopsychic tension and ambivalence and prepare the way for conflict formation, in that they weaken a person's resistance to the effects of traumatic experiences and situations.

These constitutionally predetermined irregularities of development are apt to lead to conflicts with the outside world and its demands that cannot be resolved in the way in which a normally constituted individual would take them—that is, in his stride. Hence the constitution creates its own conflicts in relation to experience, to which it then, in turn, reacts pathologically. Here again the diagnosis of inherited predisposition in neurosis by no means impedes our practical work and our therapeutic success. On the contrary, it increases our ability to recognize the chief foci of endopsychic conflict and the means by which they can be overcome. So far as mental hygiene is concerned prophylaxis by means of eugenic measures applies less to the neuroses. On the other hand, the recognition of the constitutional elements in psychogenic disorders offers wide possibilities for prophylactic treatment by way of the medical-educational training of the personality.

THE PHYSIOLOGICAL BASES OF NUTRITION *

BY

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It would not be fantastic to claim the greater parts of the fields of biochemistry, physiology, pathology, and clinical medicine as the legitimate province of the modern science of nutrition. As our knowledge of fundamental living processes increases, it can be seen more and more clearly how chemical and physical changes are not only responsible for determining the normal physical development and the maintenance of the organism in a state of equilibrium with its environment, but are equally associated with those special reactions to environmental stimuli which we recognize as signs of diseased states. This well-recognized conception implies that development, the maintenance of health, and the disturbance of health depend on the orderly or disorderly function of metabolic processes which can legitimately be held to imply, respectively, perfect or imperfect states of nutrition. It is conceivable, or rather probable, that with further advances in knowledge most of the diseased states which we now recognize will be definable in terms of definite disturbances of metabolism or nutrition. The scope of the B.M.A. Section of Nutrition would under these conditions be wide enough to cover a large part of the field of medicine; and indeed it is already capable of so doing, as the President of this Section was able to prove for us in his opening address last year. For practical convenience, however, at the present time it seems politic to limit the sphere of our interest mainly to those nutritional processes which are known to be more or less directly related to the intake or absorption of food. In regard to the subject under discussion to-day, for example, it would be within the scope of the title to include the physiology of respiration and excretion, muscular exercise, personal hygiene, and so on. Actually all the formal contributions to this discussion will be concerned with dietary constituents and their contribution to nutrition.

* Read in opening a discussion in the Section of Nutrition at the Annual Meeting of the British Medical Association, Belfast, 1937.

Awakening of Interest in Nutrition

When I was honoured by receiving an invitation to open this discussion the title had already been chosen, and it was clearly the wish of the officers of the Section that the opener should expound the views of modern experts on the dietaries considered likely to promote optimal physical development and maintenance of health among Western peoples—views which have recently been crystallized by a representative committee appointed by the Health Committee of the League of Nations. This is not the occasion for detailing the history of the inception of this committee of experts, but we may be permitted to remind ourselves of the developments which led ultimately to the publication of the committee's practical recommendations.

There is no doubt that it has been the more accurate knowledge of nutritional processes gained from the study of experimental animals in the laboratory which has been primarily responsible for the awakening of interest in the problems of human nutrition. Following the lead of such animal experiments, it has been shown that the general principles which have emerged from the laboratory are on the whole applicable to human beings. Some years ago it was clear to those who were actively engaged in this work that the knowledge which had already accumulated ought without delay to be made available for the securing of better nutrition for the masses of mankind. The recent world-wide trade depression, with its accompanying unemployment and poverty, provided the opportunity for interesting large sections of the world's populations in the question of nutrition and malnutrition. Government departments began to be conscious of the fact that they had some responsibility in the matter of encouraging the people entrusted to their care to secure for themselves and their families the largest measure of health and well-being which right feeding could give them. In the meantime the Health Department of the League of Nations had been interested in the application of the newer developments of the science of nutrition to the problems of feeding human beings, and was busy collecting information regarding the relation between nutrition and states of health and disease, and regarding the existing evidence of malnutrition among different races of mankind. The resulting admirable report by Aykroyd and Burnet rightly attracted a considerable amount of attention, and did a good deal towards preparing public opinion for the conclusions of the special committee of experts which the League of Nations appointed to consider the practical question of recommending diets calculated to secure good nutrition in human beings. The first report of this committee was published in 1935 under the title of our present discussion; the report was revised and reissued in 1936. This final version will be the main theme of my contribution.

Practical Aspects of the Nutrition Problem

I propose to limit my observations, as the League committee has done, to certain practical aspects of the problem of human nutrition. The main questions I wish to discuss are: What can we hope to accomplish by any dietary recommendations that we may feel justified in making?; and, What diets are most likely to secure the desired effect?

Only tentative answers can be given to these questions: we cannot always wait for full knowledge before planning a course of action. The primary aim in making any dietary recommendations is, except possibly in rare instances of medical emergencies, to secure the best possible state of nutrition which a suitable combination of foods can bring about. The term "best possible" is used rather than "optimal" for the reason that hereditary defects, previous disease, or deleterious environmental factors may prevent a perfectly good diet from exercising its full nutritive effect, as we shall no doubt learn from the contributions of Dr. Brock and Dr. Spence. The fact that so many private individuals and official committees have of late considered it advisable to make dietary recommendations implies that in their opinion the state of nutrition of a considerable proportion of our existing populations is not as satisfactory as it might have been under the influence of an ideal dietary. And there is much evidence to support this opinion. There is, for example, no doubt that the physical development of very large numbers of our children could be improved by better feeding during the whole period of growth. The milk-feeding tests which have been carried out in many different countries have shown that the mean rate of growth of any large group of children can be accelerated by regular supplements of this valuable food. Sufficient time has not yet elapsed for information to be available regarding the ultimate effect of such accelerated growth in the final state of development. The experience of most of those who have been engaged in controlled feeding work with laboratory animals has been that diets which promote the most rapid growth in early life maintain the animals in the most vigorous health in adult life. It is, however, interesting to note that Dr. Hayward of Cornell University found he could prolong the life of rats by stunting them in early life, a result apparently in direct contradiction with the experience of Professor Sherman, whose rats survived to old age better when they were given diets which promoted the most rapid rate of growth.

The skeletal development of children could without doubt be improved by better feeding. While the propaganda of the last fifteen years has resulted in a considerable diminution in the incidence of the grosser manifestations of rickets, there are indications that minor skeletal defects due to suboptimal bone calcification are still common. Of equal or even greater importance is the fact that the development of the teeth is undoubtedly handicapped in the majority of our children by suboptimal nutrition in early life. The relation between diet and the development and maintenance of sound teeth is of paramount importance, and I shall refer to it again in a few moments.

Before leaving the question of diet in relation to development I would draw your attention to certain less gross effects of faulty nutrition in the matter of physical development. Under this category might be included the failure of the haemoglobin-producing mechanism caused by iron deficiency in childhood. As far as is known this nutritional fault is completely reversible, but there is evidence that other faults may not be completely reversible—for example, the abnormal development of the gingival epithelium in young dogs, described by M. Mellanby as arising from deficiency of vitamin A. This made them susceptible to pyorrhoea in adult life even if adequate supplies of vitamin A were given for long periods after growth had ceased.

Effects of Suboptimal Diets

The extent and perfection of physical development is not the only benefit to be expected from proper feeding. The question of the maintenance of a state of health and full vigour is becoming more and more widely recognized as one in which right feeding must occupy a prominent

position. There is no time for me to go fully into the various ways in which suboptimal diets may affect the health. Frank deficiency diseases due to a low intake of mineral elements and vitamins, and possibly good protein, are by no means rarities in the British Isles. In many parts of our Empire they are far too common, as is now being made abundantly clear by the investigations which are taking place in Ceylon, India, Africa, and Australasia. How far minor degrees of specific deficiencies are responsible for lessened vigour and vitality, and lowered resistance to infections and degenerative diseases, is still largely a matter of conjecture, but steps are being taken to fill in this gap in our knowledge. Clinical and biochemical tests are now being used—for example, in an attempt to recognize the earliest signs of deficiency of vitamins A, B, and C—and the results may enable more accurate estimates to be made of the effect of suboptimal diets on the general state of health.

Questions which have attracted a great deal of attention and which still require much further investigation involve a more exact understanding of the relation between faulty nutrition and infection, including the response to established infections of an acute and chronic nature as well as the incidence of infection. There is much evidence that common diseases and disorders of the alimentary tract may be related to faulty feeding, though the mechanisms by which they are brought about remain obscure. The subject of dental caries deserves special mention. Though there is still much dispute as to its cause, all are agreed that it should be largely controllable by suitable feeding, and the kinds of diets advocated by the protagonists of the opposing views concerning its aetiology are not in practice very different. Further investigation is obviously desirable, but in the meantime it should be possible to reduce enormously the amount of dental decay in the next generation by securing as perfect a state of nutrition from the pre-natal period onwards as existing knowledge will permit.

Steps to Secure Improved Nutrition

This very sketchy outline of some of the results which might be expected to follow a general improvement in the state of nutrition of the masses of mankind must suffice for the moment. Our President gave us last year a much fuller and more complete account of the relation between faulty nutrition and disease. Time compels me to turn now to a consideration of the steps which should be taken to secure the desired improvement in the state of nutrition. The main lesson we have to learn from the fundamental research work of the present century is that optimal nutrition depends on the liberal supply in the diet of every food component which cannot be manufactured in the body from some other constituent of food, as well as on an adequate allowance of calories and utilizable nitrogen. The term "liberal" which I have just used in reference to the supply of essential food constituents was deliberate. In some quarters there is a tendency to assume that an adequate supply of these constituents is one which prevents the appearance of gross signs of deficiency diseases, whereas there is plenty of experimental evidence to show that improved states of nutrition can be secured by increasing the intake of such constituents above the level at which mere protection from recognizable deficiency symptoms occurs.

Though man's requirements of many of the vitamins and mineral elements can be stated to-day with a fair measure of confidence, he would be a rash man who would attempt to devise synthetic diets containing measured quantities of all known food constituents and guarantee that perfect nutrition would follow their consumption. We are not in a position yet to define the exact chemical composition of an ideal diet, and it is surely wise, therefore, to guard against any possible deficiencies by including in our ideal diet liberal supplies of those foods which experiment and experience have shown to be most likely to contain any unsuspected essential constituents, as well as those foods which have already been shown to be rich in essential food factors.

Not only should the ideal diet consist of suitable quantities of the right kinds of food, but the foods of which it is composed should be produced under conditions which ensure that it is richly supplied with the essential constituents it ought to contain. This applies to foods of both animal and vegetable origin. More and more information is coming to hand regarding the variations in the concentration of important dietary constituents in foods produced, transported, and stored in different ways. It is obviously not safe at present to assume that a diet is adequate in every respect if it contains the bare minimum of essential components calculated from chemical or biological assays carried out on foods produced or kept under varying conditions. The wise course is to include in our ideal diets liberal supplies of those foods which are to be relied on to secure the necessary quantity of essential food constituents.

Practical Recommendations

This brings us to practical recommendations for securing optimal nutrition. We shall lay stress on the provision of a liberal supply of foods rich in vitamins and in mineral elements, especially calcium and iron in an assimilable form—that is, foods which have lately received the name "protective." This is the essential feature of the diets recommended by the League of Nations Commission. Its corollary is a corresponding decrease in the amount of inert if not actively harmful foods such as refined sugar and cereals. Adequate provision of calories and protein is by no means to be neglected, but in our own country this is not such a pressing problem. The protective elements of our diet can most easily be secured by increasing the consumption of milk, especially safe liquid milk, and other dairy products, all kinds of vegetables, especially green vegetables including salads, eggs, fat fish, and liver. In a diet planned on these lines the proportion of cereals will be reduced. The question of the relative merits of refined and whole-grain cereals was not treated at all exhaustively by the Commission, who supported the proposal that part of the cereal eaten should be lightly milled. It seems possible that the best practice would be so to increase the proportion of starch eaten in the form of vegetables, especially potatoes, that a comparatively small amount of cereal would be eaten, of which the bulk should be lightly milled so as to increase in the total diet the quantity of B vitamins and assimilable iron.

Diets for Children

The Commission rightly stresses the extreme importance of providing the best possible diets throughout the whole period of growth. This is, of course, one of the reasons why the diet it recommends for pregnant and lactating women contains such a large proportion of protective foods. There is no need to dwell on the special dietary requirements of mothers, since this question was fully discussed at yesterday's meeting. But a few words must be said regarding the proposed diets for children. Their special feature is the high proportion of the total energy

value contributed by protective foods, which is largely due to the inclusion of a liberal allowance of milk throughout the whole period of growth. The diets for children between the ages of 1 and 3 contain rather more than three-quarters of their total calories in the form of protective foods; those for children between 3 and 7 contain rather more than two-thirds, and this proportion is diminished in the pre-adolescent age to rather less than one-half. This insistence on a high proportion of protective foods is really the essence of the scheme for securing good nutrition. It runs directly counter to the attitude not infrequently adopted in some quarters that as long as a diet contains enough of the essential food constituents to prevent symptoms of deficiency diseases there is no point in worrying about its make-up.

There was recently published by Mr. Rowntree in his book *The Human Needs of Labour* a dietary scale, "representing a standard below which no class of worker should be forced to live," for a family of man, wife, and three children under 14. I made a rough analysis of this diet, and calculated that even if each child received more than his share of the protective foods in proportion to his man-value equivalent, less than one-quarter of his food intake would be derived from such protective foods—and even then more than half of the protective foods would be composed of cheap cuts of meat and condensed skim milk. It is true that even a diet such as this compares most favourably with diets consumed in many parts of the world. To take just one instance, Dr. Aykroyd has recently carried out a survey of diets in South Indian villages. Among the poorest group the diet averaged 1,664 calories per unit of man-value, and 95 per cent. of the calories were derived from cereals. The children forced by poverty to live on such diets showed only too frequently gross manifestations of deficiency diseases and general malnutrition, while the children brought up on the diets suggested by Mr. Rowntree might escape without immediate obvious symptoms of food deficiency other than slight indications of rickets, poorly developed teeth susceptible to decay, and a general physique below their potential optimum. All who have tried to put into practice the modern principles of nutrition, whether on experimental animals or children, would agree, I think, that it is worse than useless to lay down as a standard any diet which is likely to produce imperfect development and suboptimal states of nutrition. It is true that mere pious expressions concerning the make-up of the ideal diet will not enable the poor to buy the food best calculated to promote perfect nutrition. Fixing a dietary standard which approaches the ideal for promoting good nutrition at least draws attention to the urgency of the practical problem of trying to bridge the gap between the ideal and the actual, whereas an admittedly low standard merely encourages complacent individuals and authorities to continue their policy of *laissez-faire*.

Our discussion is concerned with the physiological, not the economic, bases of nutrition, and it would be out of order for me to pursue further the sociological and political implications of dietary standards. It will suffice to remind you that the Health Organization of the League of Nations is deeply concerned with the economic, agricultural, and political problems involved in attempting to supply a sufficiency of health-promoting foods for the populations of mankind. Our own Government Departments are already tackling the same problem, and a perusal of the first report of the Ministry of Health's Advisory Committee on Nutrition will show that these practical aspects of the situation are receiving serious attention.

THE ROLE OF HETEROPHORIA IN BINOCULAR DISHARMONY

WITH SPECIAL REFERENCE TO AIR PILOTAGE*

BY

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To confine this paper entirely to the domain of the air would be like writing the final lines of a book without considering the framework of the first chapter. The condition that we style heterophoria must be age-old, but the contest for mastery of the air is, within practical limits, an event of our generation. Racing through space does not itself produce heterophoria, but heterophoria may severely affect safe aerial manœuvre. Therefore let us consider first the part that heterophoria may play in binocular disharmony upon the ground. Furthermore, let us confine ourselves to this condition, ignoring at once all other visual states that are so wont to wriggle into the picture, such as squints of small degree, transient diplopias that are so often the precursors of insular sclerosis, and pareses and paralyses of the ocular muscles.

Symptomless and Symptom-producing Heterophoria

We cannot have discord where there is no rivalry. The processes of evolution have so shaped the visual pathway that only some check in the maze of development, or some unreasonable assault through the demands of modern life upon the binocular function, can create a symptom-producing situation. We may speak of heterophoria under two headings: (1) inherent (slight; marked); (2) acquired. Leaving out all questions of refractive and pathological states, the one great predisposing cause of inherent heterophoria is *dominant macular reception*. This may occur without rivalry, in which case symptoms as opposed to signs do not arise in later life; or it can be present in a slight degree (in this case with rivalry), thus creating a potential source of trouble, according to the visual destiny of the individual.

Heterophoria may be acquired at any stage in life from school age to the presbyopic period, either superimposed upon a dominant macular reception of slight degree or arising as a condition primarily induced by the circumstances of everyday life. To differentiate the one from the other is sometimes a matter of a little difficulty. In this the age of onset of symptoms helps. The man who has *acquired* heterophoria without the influence of an inherent condition tends to complain of ocular discomfort early in the process. So strong has been his binocular conception that he is awake to the first falter. There is another approach to the problem—namely, by an examination with the stereoscope of the binocular reception rate, and also the appreciation of depth. On the stereoscope such a case will demonstrate rapid alternation with those charts designed for the examination of simultaneous binocular perception, will readily appreciate simple depth, and will proceed to give a good account with the more exacting charts. All this is in direct opposition to the *acquired* heterophoria with an inherent foundation. It is a natural corollary (in these cases) that symptoms are proportionate to the primary strength of the binocular chain. Much that can be labelled heterophoria diagnostically is quite symptomless, and is the outcome of a strong inherent tendency.

* Read in opening a discussion in the Section of Ophthalmology at the Annual Meeting of the British Medical Association, Belfast, 1937.

In the innumerable occupations that shape the intricate design of modern life there are two things that prey for ever upon us. One is the call for prolonged concentration at close range, while the other is a natural worry with regard to the eventual outcome of our endeavours. Any cause that irritates the mind may easily hinder the smooth running of the former and add a new load to the latter. We are now treading the nightmare path of psychology, but not without reason.

The part that heterophoria may play in the induction and maintenance of a psychological state is not sufficiently emphasized. Too many times has the association been demonstrated for any doubt to remain. It is a matter of experience that the most intense headaches can be produced by heterophoria, headaches that act not only as a handicap at work but may actually confine the sufferer to his bed. If the ability to maintain an occupation depends upon detailed and accurate work, the carrying out of which in turn produces the ocular symptoms, the picture is then complete.

It is wrong to hold that all sufferers from heterophoria are constructed with the addition of a strong functional element in their mental architecture; but it is right to maintain that very many symptomatic cases are definitely unstable. A typical example of this is well shown in a female patient, aged 35, who for several years had confined herself to her house. Her condition bordered on panic. She requested that I should leave my consulting-room door ajar so that she could run from the house if she found the strain too great. She had three to four intense headaches every week. These began in the morning and worked up during the day. Her vision was:

Right ... 6/18 $\frac{-0.5 \text{ Sph.}}{-0.75 \text{ Cyl.}}$ = 6/6 15°

Left ... ... 6/60 $\frac{-1.25 \text{ Sph.}}{-1.25 \text{ Cyl.}}$ = 6/24 70° (partial amblyopia)

She was found to have 14 prisms of hyperphoria. With the addition of suitable prisms (she had had correction without prisms before) she improved greatly. Within a month she was walking in the country and was beginning to tolerate the presence of crowds and traffic. The dragging in her left eye was relieved. She was unsuitable for training.

The Symptom-producing Phorias

Of all the phorias that produce suffering hyperphoria easily holds the field. This is explainable on the grounds that the binocular vision is quickly strained above the horizontal plane. No doubt this constitutes a big factor in the production of miner's nystagmus. The Bishop Harman test demonstrates this very prettily. In vertical latent deviation there is little latitude, and subconscious control rapidly gives place to central conscious effort. Where these two meet there also lies the evil of their plotting. It may be remarked that certain of the hyperphorias are symptomless, which is perfectly true, for they are of the marked inherent type.

Exophoria with weakness of convergence constitutes the second group of symptom-producing cases. Here the occupation of the sufferer influences the picture. I would quote the case of a very busy solicitor who was about to leave his practice on account of his inability to give long hours to the close study of his cases, owing entirely to this condition.

Ocular rivalry cases are a further variety, while cyclophoria enters the field not so much as a primary condition but as an unpleasant addition usually to hyperphoria. It is present as a result of overaction of the torsion group of muscles, and its discovery is a warning not to show undue optimism with regard to prognosis.

Heterophoria in Relation to Flying

It is from this world of our civilization that we are asked to select our pilots of aircraft. Many of the potential causes of disharmony have been met with by the men in their studies and duties upon the ground. The ledger clerk, the draughtsman, the engineer, the man who follows an occupation calling for monocular estimation—all these have encountered the strain for varying periods. It is remarkable how rare it is to discover gross defects. It says much for the strength and the latitude of the binocular function.

The extent of the various deviations allowed for acceptance in the Royal Air Force is the result of long study, but cannot even yet be said to have reached finality. The subject is exceedingly involved. There is, for example, the problem of false panoramic conception, which has produced itself for solution and upon which work is now being done. In the past it was considered that the exophoric had a tendency to stall his aircraft, while the esophoric would come down heavily upon his wheels. But it is not by any means a simple process of fitting theory to facts. When the landing of an aircraft is affected by the presence of heterophoria in the pilot it is more usual for a general mixing of high and low approaches to take place. The explanation lies in the fact that an error in landing of one type results in an overaction by way of correction at another attempt, and as there is no stable point of reference the whole affair becomes erratic.

The cases of real interest are always those of pilots who have flown successfully and then suddenly experience difficulty with the final stages of their approach. An approach which errs within so small a degree as plus or minus five feet can end in a nasty accident, usually by the propeller catching the ground and turning the aircraft over. Repetition of these events calls for a very careful examination of the binocular state. Here it is wise to tread with caution. The disharmonies that heterophoria may produce in air-pilotage are well known and proved, but on these very grounds a false jump to conclusions must be carefully avoided. Every discovered phoria with a history of flying trouble is not for certain the absolute root cause. Mental and physical fatigue; the first indication of some illness of slow onset; a growing dislike to flying; neurasthenia—all these must be eliminated. It usually happens that the pilot with a pure ocular muscle defect is anxious to return to the full duties of his branch, and resents the visual handicap which is confining him to the ground. It may be asked, How does such a state come about in a healthy man on active service? The answer is that heterophoria may occur as a result of prolonged fatigue from concentrated flying, from tropical asthenia, from malaria, or from head injury. It is not by any means a condition that tends to persist once the primary cause, illness or accident, has cleared up, but there undoubtedly are times when heterophoria remains as a genuine state and requires active attention. It is usually found that such a condition is of the inherent type, which has been kept within bounds in a body physically and mentally sound, but that the constitutional upheaval has left its mark in a potentially weak spot. It is necessary always to form an opinion as to the optimum time to attack the condition by exercises. And it is easy

to be led astray. Let me quote two examples where I carried out quite useless treatment. The first was many years ago. The case was that of an officer with much flying experience. He passed through my hands in a purely routine manner. He had heterophoria of the exophoric type, far outside the permitted limits. He underwent a course of training, and admittedly showed much improvement, coming now well within the necessary standards. He had had, however, no particular trouble with his flying. On his return to aircraft he discovered that he had to face the situation from a new angle, and that flying was not nearly so simple. He was thankful when, in due course, he relapsed into his old state, in which he was perfectly happy. He was one of those cases of inherent heterophoria with dominant muscular reception, and it was I who from inexperience produced disharmony. There was another case, that of an officer with heterophoria of the esophoric type. From his history and from the clinical findings there was every reason to undertake training. This went well—in fact, too well. He began to develop gastritis. The clouds broke and revealed his mental landscape. He had acquired a growing distaste for flying. His faulty judgement of distance no doubt added fuel to this, but his training had again prepared him for the air. Therefore he transferred his discomfort lower down. I speak of these cases merely to emphasize the fact that we must always be prepared to stumble over them.

Treatment

It is not proposed to enter into any details, but rather to stress certain points that are wont to be omitted. In the first place, symptomless heterophoria is far better left alone. To obtain the ideal in binocular vision is a very worthy aim, but the sleeping dog is better left asleep.

In symptom-producing cases no time is wasted that is spent on a complete survey of the patient's mental framework. With regard to the order of attack our greatest lever is the stereoscopic sense. The more years one passes in the study of these cases the more one is inclined to relegate a special pathway to the realm of stereoscopic appreciation which, if intact, is ready always to answer to the call of stimulation. To reach it, and to use it to the best advantage, it is essential first to develop equal macular reception and then to work for a space upon simple stereoscopic pictures. I am now experimenting with a rotating stereogram made for me by Messrs. Theodore Hamblin. The idea here is to widen and strengthen the stereoscopic sense through those angles of the perimetric arc that are not specifically employed in this fashion. Usually after two weeks the road is open for the use of the amblyoscope, or one of its near relations.

I feel that the worst service we can do to this promising bud on the tree of ophthalmology is to fret round it with exaggerated care. Let us confine its nomenclature to reasonable proportions and tear aside the veil of mystery that is being drawn about it. To-day ophthalmic surgeons are divided into two groups upon the merits of orthoptic treatment—namely, those who consider it most valuable and those who do not. Both are right. The reason why this division exists is because too little time is given to analysis and too much to empirical treatment. The great variety of binocular disharmonies that are arranged under the group heading of heterophoria are very real conditions, carrying with them often extreme suffering. The relief that can be given by orthoptic treatment in a great number of these cases is too well established for argument.

The Use of Prisms

Prisms for dealing with symptom-producing heterophoria should be limited to two conditions:

1. As a means of helping cases that have occurred as the result of cerebral concussion. Sometimes an eye-shade is necessary as a temporary measure where there is troublesome diplopia. This temporary ocular occlusion can do no harm to the binocular receptive rate in adults. If the prognosis is favourable this does not last much over a month. Then a *full prism correction* is valuable, and may be demanded in both horizontal and vertical directions, at one and the same time. Reductions (in strength) are usually necessary in periods of two to three months. Then after the *safe interval*, which should be six months, possibly longer, training can commence. During the preliminary stages of training the prisms should be retained in balanced proportion to the progress of the case. Then training will take the upper hand, and the prisms can be safely discarded. Should, however, a residual and intractive hyperphoria remain, a safe rule is to prescribe such prisms as will relieve one-half to two-thirds of the uncorrected deviation. The remainder is nearly always mastered by the muscle tone which has been imparted through training.

2. As a means of relieving an inherent or acquired symptom-producing hyperphoria. Sometimes prisms, or indeed operations, may become the only means of affording relief. In other cases most valuable results may be achieved by a combination of training and prisms correction. Once more reductions are made in prism strength during treatment. If a complete cure is effected so much the better, but candidly I think this ideal is rarely attained in the higher deviations. Then, again, it may be necessary to take up part of the strain by prisms. Never is it wise to give full balance in this manner, as some *active* vertical adjustment helps to maintain stability. It is most important to distribute the prism power suitably between the two eyes. It is not enough to divide this equally.

Always should the greatest care be exercised in selecting that which can be cured or markedly benefited from that which cannot.

O. Devold, F. Batt, K. Closs, and J. Backer (*Norsk Mag. Laegevidensk.*, July, 1937, p. 899) undertook in 1934 and 1935 a goitre survey of the inland district of Modum in Norway. They examined 4,560 of the 11,000 inhabitants. The measurements of the thyroid followed Hunziker's technique, and in many cases iodine determinations of urine collected over twenty-four hours were undertaken. The iodine content of the drinking water and of the milk and eggs was also estimated, and the findings were compared with iodine analyses of urine, drinking-water, milk, and eggs in Oslo. It was found that the iodine content of the urine and drinking-water was considerably lower in Modum than in Oslo. In 65.6 per cent. of all the persons examined some enlargement of the thyroid was found, the figures for the two sexes being 57.1 per cent. for men and 73 per cent. for women. The largest number of goitres were found in school children; in women it was most common between the ages of 20 and 29 in farming areas. Only 58 per cent. of the whole industrial population showed signs of goitre, as compared with 72 per cent. of the farming population. One reason for this might be that in the farming districts only 15 per cent. of the population ate fish at least once a week, whereas 63.5 per cent. in industrial areas ate fish once weekly or more often. Parous women suffered more often and from larger goitres than did nulliparae. The incidence of goitre increased with decrease in the social status of the inhabitants, and incomplete forms of cretinism were found. The authors conclude that prophylactic medication with iodine-containing sodium chloride would be more rapidly effective than a revolution in agricultural menus to include more sea fish and provide seaweed as cattle fodder and manure.

THE ACTION OF MEAT EXTRACTS AND RELATED SUBSTANCES AS GASTRIC STIMULANTS IN MAN

BY

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Meat extracts cause a profuse secretion of gastric juice in animals, as was first shown in Pavlov's laboratory by Lobassoff (1897). He worked with dogs, equipped with a Pavlov pouch, and showed that the presence of Liebig's extract in the main stomach produced a marked secretion in the miniature stomach. Similar observations have since been made by numerous authors, all on Pavlov-pouch dogs or on comparable surgical preparations (Popielski, 1902; Gross, 1906; Lönnqvist, 1906; Orbeli, 1906; Kryszkowski, 1913; Zeliony and Sawitsch, 1911; Zeliony, 1913; Edkins and Tweedy, 1909; Ciminata, 1925 and 1926; Lim, Ivy, and McCarthy, 1925). But it does not appear to be accepted that similar effects are found in human beings. In many textbooks of physiology and nutrition statements such as the following are met with: "Commercial meat extracts are possibly of value as gastric stimulants."

Experimental Tests

A series of experiments on medical students has been carried out in order to establish this point. The technique of the fractional test meal introduced by Rehfuss (1914) was adopted. Bergeim, Rehfuss, and Hawk (1914) state that water is a strong gastric stimulant in humans, whereas Pavlov (1910) says that water was devoid of any stimulant action in his animal experiments. Apart from this no significant difference between the reaction of the human and the animal stomach has been recorded. It was not anticipated, therefore, that any marked difference in the reaction to meat extracts would be found.

The various test meals were given to the subject on different days and the responses compared. Ryle (1926) has shown that the gastric response of the individual to the same test meal on different days is essentially the same. This was confirmed in several subjects, and therefore any dissimilarity noted in the results from the substances examined is due to their varying stimulating power. The oatmeal gruel meal described by Ryle was used as the standard. The response to this is very constant for each subject. Using water as a standard is unsatisfactory, as the results vary greatly.

The following substances were examined. (1) Beef powder, prepared from dried lean beef. (2) Extracted beef: this is the residue of the meat after the water-soluble extracts have been removed in the manufacture of commercial meat extracts. (3) Direct extract: this is made by extracting meat completely with water and concentrating the resulting liquor. (4) The commercial meat extract known as bovril. (5) Sodium glutamate. This substance has a meaty taste and is used as a flavouring agent. It is not present in meat.

Technique

The tests were performed on a fasting stomach, in the morning before breakfast or in the afternoon after an early breakfast. If the stomach was found to contain more than a trace of food the test was postponed. After intubation the residual contents were removed and the stomach washed out with 200–300 c.cm. of warm water and the test meal administered. Samples were withdrawn as soon as the meal was finished, and subsequently at fifteen-minute intervals until the stomach was empty. In some tests warm water slightly less in volume than the usual bulk of the meal was given, and the substance under examination administered in a concentrated solution through the stomach tube. In this way any stimulation due to the taste of the extracts was avoided. There were no significant differences in the response obtained after administration of the extract in this manner and when the subject was allowed to taste the material.

The following determinations were made on each sample. The free hydrochloric acid and the total acid, and the pepsin, were estimated. In titrating the samples for the estimation of the free acid, *p*-dimethyl-amino-azobenzene, Töpfer's reagent (1894), mixed with half of its weight of methylene-blue, was used as the indicator. The mixed indicator exhibits a magenta colour on the acid side of the change point, a bright green colour on the alkaline side, and a neutral shade of pale grey at *p*H 2.9. The total acid was estimated by titrating to the change point of phenolphthalein. Pepsin was estimated by a modification of Mett's method. The tubes were prepared by the method of Christiansen (1912), and successive batches standardized before use against the preceding batch. 0.5 c.cm. of the unfiltered sample was mixed with 9.5 c.cm. of a phosphate buffer of *p*H 6.8 left overnight, and filtered to remove the mucus and protein matter as recommended by Ege (1924). The *p*H of the filtered material was adjusted to 1.2–1.3 by the addition of concentrated hydrochloric solution. The resulting solution was incubated with the Mett tubes at 35° C. for a varying period, depending on the strength of the pepsin solution. Weak solutions were left for several days. All calculations were based on the length digested in twenty-four hours. Four measurements were made on each sample. According to Patterson and Adler (1932) the pepsin is proportional to the cube of the length of fibrin digested. This measure was used in the present test. The results are shown in Tables I, II, and III.

Results

Table I contains the average HCl values as produced by the various substances. The figures indicate cubic centimetres of decinormal HCl. In Table II are given the

TABLE I.—*Table of Average HCl Values*

	Resting juice	15 min.	30 min.	45 min.	60 min.	75 min.	90 min.
Gruel ..	0	0.6	13.4	30.0	17.3	18.5	13.0
Beef powder	2	1.0	11.5	24.5	26.5	37.75	32.0
Extracted beef ..	0	0	5.0	10.6	14.2	10.8	16.4
Direct extract ..	0.1	1.0	11.0	29.0	18.0	20.0	8.0
Bovril ..	0	1.0	14.0	37.0	49.0	—	—
Sodium glutumate	0	0	7.0	—	—	—	—

TABLE II.—*Table of Emptying Times of Stomach*

	Average	Expressed as percentage of gruel
Gruel	97 minutes	100
Beef powder	107 „	123.6
Extracted beef	84 „	96.5
Direct extract..	92 „	104
Bovril	63 „	74.2
Sodium glutamate	36 „	44.6

figures for the emptying times of the stomach. In the first column the average figures are shown, and in the second column the figures are expressed as percentages. The emptying time with gruel was called 100 per cent. in each separate experiment. For each individual the time taken for the stomach to empty with the different substances used was expressed as a percentage of that taken with gruel. The results were averaged, and, as will be seen, are not quite the same as the average times. In Table III the average pepsin values are given.

TABLE III.—*Table of Average Pepsin Values*

	Resting juice	15 min.	30 min.	45 min.	60 min.	75 min.	90 min	105min.
Gruel ..	0.43	8.3	9.5	9.2	11.3	35.3	11.4	—
Beef powder ..	1.08	1.2	8.8	23.9	30.0	63.4	82.8	42.5
Extracted beef ..	0.5	1.75	7.7	7.8	18.4	7.1	15.8	—
Direct extract ..	0.7	0.17	3.75	4.7	6.9	10.0	5.3	—
Bovril ..	0.15	2.3	7.1	8.7	19.7	—	—	—
Sodium glutamate ..	0.025	1.1	24.2	—	—	—	—	—

Beef powder, which represents whole meat, produces a marked secretion of HCl over a long period. The watery extract is not so powerful, producing a secretion not much greater than that of gruel. But the extracted beef is even less efficient. The most effective stimulant is bovril. Sodium glutamate leaves the stomach so quickly that its effect on HCl secretion is negligible. Beef powder delays the emptying time considerably as compared with gruel. Extracted beef and direct extract are not significantly different in their emptying times from that of gruel. Bovril shortens the time by one-third. Sodium glutamate makes the stomach empty very quickly. The extracted beef produced a very marked flow of mucus; in one case this was so great as to block the stomach tube.

The secretion of pepsin is high when beef powder is administered. Of the substances examined that was the only one which stimulated the gastric mucosa to secrete pepsin. The other substances do not differ greatly from one another in their effect on pepsin secretion, sodium glutamate being a possible exception.

Commentary

In conclusion it can be stated that meat extracts act as stimulants of the gastric mucosa. The gastric secretion so produced is normal in HCl content. Bovril produces a marked stimulation of the gastric mucosa with a stimulation of HCl which at sixty minutes after administration is nearly three times greater than that produced by gruel. It reduces the emptying time by approximately 30 per cent. as compared with gruel. Sodium glutamate causes such rapid emptying of the stomach that it is impossible to draw any definite conclusions as to its effect on gastric secretion.

These results have some clinical significance. Following acute illnesses there is commonly a depression of gastric secretion. The gastric juice is poor in HCl, but there is rarely any deficiency of pepsin. In such cases meat extracts, by stimulating the mucosa to an increased flow of HCl, restore the gastric juice to normal.

Conclusions

1. Meat extracts have a stimulant action on the gastric mucosa.

2. The water-soluble fraction of meat is almost as efficient in stimulating a flow of HCl as whole meat.

3. The secretion of HCl is greater with bovril than with any other substance examined, including whole meat.

4. Whole meat in the form of beef powder is the only substance examined which stimulated a flow of pepsin.

5. The emptying time of the stomach is less with meat extracts than with whole meat. Bovril reduces the time by 60 per cent. as compared with beef powder.

6. Sodium glutamate has little or no stimulant action. The stomach empties very rapidly when this substance is given.

I have pleasure in acknowledging the assistance of the medical students of King's College who were good enough to act as subjects. I am very grateful to Dr. O. G. Edholm, who has worked out the tables and has also prepared the paper for the press.

REFERENCES

Bergeim, O., Rehfuss, M. E., and Hawk, P. B. (1914). *J. biol. Chem.*, **19**, 345.
Christiansen, J. (1912). *Biochem. Z.* **46**, 257.
Ciminata, A. (1925). *Arch. Fissiol.*, **23**, 221.
—— (1926). *Arch. ital. Biol.*, **76**, 38.
Edkins, J. S., and Tweedy, M. (1909). *J. Physiol.*, **38**, 263.
Ege, R. (1924). *Biochem. Z.*, **145**, 66.
Gross, W. (1906). *Arch. Verdauungskrank.*, **12**, 507.
Kryszkowski (1913). *Arch. ges. Physiol.*, **150**, 128 (quoted by Sawitsch and Zeliony).
Lim, R. K. S., Ivy, A. C., and McCarthy, J. E. (1925). *Quart. J. exp. Physiol.*, **15**, 13.
Lobassoff, J. O. (1897). *Arch. Sci. Biol.*, St. Petersburg, **5**, 425.
Lönnqvist, B. (1906). *Scand. Arch. Physiol.*, **18**, 194.
Orbeli, L. A. (1906). *Arch. Sci. Biol.*, St. Petersburg, **12**, 71.
Patterson, J., and Adler, J. (1932). *Brit. J. exp. Path.*, **13**, 72.
Pavlov, I. P. (1910). *The Work of the Digestive Glands*, London.
Popielski, L. B. (1902). *Zbl. Physiol.*, **16**, 121.
Rehfuss, M. E. (1914). *Amer. J. med. Sci.*, **147**, 848.
Rosewarne (1930). *Food Manufacture*, **5**, 227.
Ryle, J. A. (1926). *Gastric Function in Health and Disease*, London.
Töpfer, G. (1894). *Z. Physiol. Chem.*, **19**, 104.
Zeliony, G. Y. (1913). *Arch. Sci. Biol.*, St. Petersburg, **17**, 425.
—— and Sawitsch, W. (1911). *Verhandl. ges. russ. Arzte*, St. Petersburg.

The annual report for 1936 of the Health Department of the municipality of Singapore records a continued heavy incidence of enteric fever. During the year 461 cases, including six of paratyphoid, were notified, compared with 424 in 1935. Of these cases, eighty-two were in school children. The notifications were more or less evenly spaced over the months, and there was no localized outbreak. The spread of infection is attributed to carriers among those engaged in preparing food sold by hawkers in the streets, and there is strong presumptive evidence that the hawking of ice-cream and iced drinks is often responsible. More arbitrary powers for dealing with food hawkers have recently been granted, but their full application will not be feasible until the passing of the new Food and Drugs Regulations. With regard to malaria, the report states that anti-mosquito work has been continued on a large scale. The chief undertaking during the year was the cleaning up of the breeding grounds of *A. sundaicus* in three river basins, following a sharp outbreak of malaria in the latter part of 1935. The greater part of the breeding grounds was dissipated by breaking down the containing bunds of numerous fish ponds, thus admitting tidal water. Those still out of reach of the tide were either filled in with debris from the demolished bunds or were connected together by deep drains, with a discharge to bigger drains protected by tidal flaps at their exits in the bunds. Nearly 200 fish ponds and over 500 vegetable ponds were treated by these methods.

TREATMENT OF SPASTIC PARALYSIS

BY

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The system I propose to outline was developed more than twenty years ago, during the war in the course of work done on soldiers convalescent from cerebrospinal meningitis. It was developed quite empirically, and the theoretical principles underlying the method have only recently been applied. Since the war only the more severe spastic cases—for example, those suffering from cerebral diplegia or Little's disease—have been treated. Recently, however, the work has extended to less spastic cases, such as post-thrombotic paralyses.

Aetiology

The causes of spastic paralysis are many. They include birth injury; encephalitis following the acute specific fevers, such as diphtheria, typhoid, or poliomyelitis; syphilis; and infantile cerebral haemorrhage. Arrest of growth or failure of development of the cerebral cortex is responsible for most cases. There are, too, other obscure causes. In any event the result is damage to the cerebral cortex of a greater or less degree, and this is manifested by motor, sensory, and psychic disturbances. Many of the patients seem to be idiots. Over 50 per cent. of our series of 200 cases gave this impression because of dribbling of saliva and inability to control the facial muscles and to express themselves, but after treatment only four have had to be rejected as true idiots (c.f. case reports). Many patients who were apparent idiots showed quite normal intelligence after the spastic condition had been cured.

Sensory Effects

In spastic paralysis the extent of the associated sensory disturbance is not generally realized. It manifests itself, however, in various ways. There is loss of appreciation of the relative intensity of different stimuli—for example, fine differences of heat and cold and touch are imperceptible. Appreciation of spatial relationships may be lost, the patient being unable to identify the precise part stimulated (tactile localization) or to discriminate between two points of stimulation (tactile discrimination). Some interference with the interpretation of proprioceptive impulses, especially in the smaller joints, may be noted. The muscle spasm itself upsets the normal proprioceptive impulses from both muscles and joints. Astereognosis may also be present.

The importance of these sensory disturbances must always be borne in mind. All the phenomena of incoordination are for the most part of sensory origin. It follows that educative therapy must also have a sensory basis. The brain must literally be flooded with a sequence of properly regulated sensory impulses.

Motor Disturbances

There is seldom any loss of the impulse to make a movement, but the muscle spasm and sensory impairment cause gross clumsiness.

The increase in tone may be localized to one group of muscles, but is more usually general. Normal tendon reflexes are exaggerated, and the Babinski and Oppenheimer reflexes and Gordon's reflex and ankle clonus may develop. Receptive areas, stimulation of which gives rise to spasm of the spastic muscles, are situated at the distal parts of the extremities. Any stimulation of these areas in the course of routine treatment must be avoided.

The muscles of the spinal or decerebrate animal, and usually all spastic muscles, respond to a stretch with an increase in tone. This so-called stretch reflex, due to the presence of stretch receptors in the muscle and lying parallel with the muscle fibres, is especially marked in the physiological extensor group of muscles. Because of this reflex response any attempt to move a joint when the muscle tonus is still increased results necessarily in a further increase in the muscle spasm. This must be avoided; the muscle groups should first be inhibited (*vide infra*) before any movements involving stretching are undertaken.

Ataxia in this condition is due to both sensory and motor involvement; it is often marked and of a cerebellar type. There is also decomposition of movement, any action being carried out as if by numbers; thus in trying to bring the heel on to the opposite knee while lying in bed the heel is dragged along until it reaches the knee, raised to the proper height, adducted, and finally placed on the knee. Asynergia is due to the lack of co-ordination between antagonists and agonists. If the patient attempts to flex the elbow the triceps which antagonizes the movement may go into tonic contraction. Dysmetria is shown in that the force employed in any action is ill adapted to the aim of the movement; the hand usually shoots past an object which is to be picked up. Occasionally the spastic paralysis may be associated with some flaccid paralysis, usually of the neck muscles (Fulton, *Arch. Neurol. Psychiat.*, 1934, **31**, 211).

Treatment resolves itself into inhibition of the motor spasm, and intensive sensory, and to a less extent motor, education. The motor education must follow the sensory. The patient may be likened to a baby. There is as yet no appreciable sensory development of the cortex, and so a sensory education together with the inhibition of spasm must precede motor re-education. The simplest actions are taught first and accessory movements added until the finer and more complex muscular efforts are mastered. All the harmful phenomena of the disease are progressive. The exaggerated muscle tone increases, leading finally to contractures and deformities of joints. Sensation becomes more and more impaired, and psychological changes follow in a vicious circle. Thus it is of extreme importance that the patient should begin treatment early.

General Treatment

The general health is supervised and adequate food and rest provided. The patients are told to rest from 2 p.m. to 4 p.m. and to get plenty of sleep at night. If of school age they do not attend school, but are given lessons at home by the mother or else take a correspondence course. School is forbidden because the spasticity is likely to increase in front of others: the awkwardness of their movements often excites jeers from other school mates; they become nervous, their awkwardness increases, and they suffer psychologically. A further point is that the children are often backward and do not get the same benefit from teaching as the normal members of the class. They progress better with individual tuition. The time taken for treatment in the clinics varies from half an hour to an hour each day, depending on the severity of the case.

It should be noted at this point that we do not advise certain forms of therapy for the following reasons: electrotherapy, since it causes muscular contraction and

heightened tone ; massage, because it increases the tone of spastic muscles, especially if applied to the receptive areas ; and also passive and active movements of the joints of the extremities, for by stimulating the stretch reflex they too cause heightened tone of the muscles. Splinting and bracing is also avoided as much as possible. It is harmful in the extensor group of muscles and the more distal muscle groups, but at times may be used advantageously in inhibiting spasm of a proximal group of muscles, usually flexors—for example, the hamstrings. In these proximal flexor groups the lengthening reaction is elicited and is not harmful. Hydrotherapy is valuable, but the cold douche must be avoided, since it increases tone.

Inhibition of Muscular Spasm

The first essential of treatment is to inhibit the muscular spasm. A warm bath at a temperature of 37° C. is given at the start of treatment. This is a necessary preliminary in any form of education of spastic muscles, and it produces marked relaxation of the spastic muscles. The patient is asked to relax and breathe deeply. At the same time the affected muscles are gently manipulated. This stimulus is a powerful inhibitor of muscle tone. It is important to remember that the most proximal muscle groups of a limb which is in spasm (the deltoid and pectoralis major muscles, etc., in the upper extremity) must be inhibited first ; thus the receptive fields are avoided. The muscle groups are treated proximodistally in succession until they relax, the manipulation being as gentle as possible, especially when the distal receptive fields are approached.

These gentle stimuli cause a state of inhibition of the spasm and what is called the inhibitory after-period develops. This period is gradually extended as treatment proceeds, and generally becomes permanent—that is, conditioned. During this inhibitory phase the muscles may be stretched without evoking the stretch reflexes. The attendant then passively moves the joints, starting very gently with the most proximal joint. At the first sign of return of tone the muscle is again inhibited and the joint again put through a complete range of movement. These movements must be very slow and the patient's attention should be concentrated on them, the attendant saying, "I am abducting the shoulder," or, "I am adducting the shoulder." By this "attention training" the proprioceptive sensations are reinforced and sensory re-education takes place. "The patient's mind must be made to follow the movements of the joints and be educated by these movements. . . . The extremities educate the brain." New nerve pathways are opened up and proprioceptive sensation will slowly return. It is essential, however, that with each passive movement the attendant secures the absolute mental co-operation of the patient.

This routine is slow. Advanced cases may need many weeks of inhibition of the more proximal muscles before the distal groups can be treated and the smaller joints moved without exciting the stretch reflex response. However, in time this can be done, and then sensory education of the more distal joints may be undertaken. Until sensory education is complete nothing but the simplest active movements are permitted. The patient and the parents are taught these principles, and may apply them at all times at home, fatigue only being avoided.

As in Pavlov's experiments, we find that inhibition will readily spread. In patients with dribbling of saliva and incontinence of urine and faeces, if the muscles of the face and neck are inhibited and dribbling ceases it is found that often the bladder and rectum will also be controlled. It is always easier to inhibit successive groups of muscles. Speech returns to some degree without any special training. With continued inhibition and sensory training the muscles develop a state of conditioned inhibition and the spasm disappears. This training may take many years, but during the whole of this time special movements are taught. The first acts taught are those essential to washing, feeding, and dressing. Later on the finer movements such as writing and playing the piano may be acquired.

Special Exercises

Quite apart from the ordinary relaxation exercises, in which the patient is asked to relax or to take a deep breath and relax, deep breathing and sighing exercises are helpful. In another exercise the muscles of the limb are loosely hunched up and released, starting at the shoulder girdle and proceeding down to the fingers. If when the fingers are being moved the muscles of the forearm become spastic the patient is told to relax and the dorsum of the hand is percussed lightly with the attendant's fingers.

The lack of balance, very noticeable in this condition, is to some degree overcome if the attendant can induce the patient to recognize contact between the sole of the foot and the substance of the ground or floor. For this reason in all walking exercises coir matting is used, so that the proprioceptive stimuli will be reinforced by increased cutaneous impulses. Stability is obtained by teaching the patients to climb steps. The weight of the body is forced on to each foot alternately with the patients concentrating all their attention on each movement. Long perseverance in this step-climbing will eventually result in the linking up of the physical balance and mental control. Specially constructed steps covered with coir matting allow the attendant to supervise every movement and give the patient greater confidence. A sand trough is used later, and the greater effort required to keep the balance in the sand further reinforces the sensory impulses and slowly greater control is developed. It is essential to train the patient to get the heel down on the ground, and this is done by the attendant holding each heel. The patient is taught also to stand firmly on both feet and to bend and straighten the legs. The individual control of movements of both the ball and heel of the foot must be taught, and such teaching is accelerated by these methods of proprioceptive reinforcement.

Exercises in Co-ordination

The patient, lying down, is asked to place the heel of one foot on the opposite knee, guided by the assistant if necessary. The movement must be slow and purposive, but the patient must remain relaxed. The child is directed to place his foot in the assistant's hand, which is moved to and from various positions until practically every muscle in the lower extremity has been brought into play. Similar controlled movements are practised with the upper limb. No rhythmic movements or quick cyclic movements are ever attempted.

Often a patient has the appearance of idiocy because the muscles which control the action of swallowing are spastic. Saliva continually dribbles from the mouth, and speech is defective or absent. Early education of these muscles is imperative. Inhibition of spasm is effected, and a fluid pleasant to the palate of the patient must be given at regular intervals in very small doses ; sweetened fruit drinks are particularly useful. An effort is made to swallow. Every case has responded to this method. Incontinence of urine and faeces tend to clear up at the same time, due to the spread of conditioned inhibition.

The muscles controlling the movements of the tongue must also be subjected to special exercises. The patient is trained to protrude the tongue, and also to curve it upwards towards the nose and downwards towards the chin. The movement towards the nose is the hardest to perform. All the sounds in which the letters "t," "d," "n," and "w" are involved are the most difficult to utter, and should be concentrated upon. The patient is also asked to point the tongue to either side of the mouth. The child is not asked to put all his mental effort into the movement but is encouraged to relax: the movements are assisted by the attendant, and are attempted only after relaxation of muscle tone has been attained.

A spasm of the muscles of the neck sometimes interferes with the mobility of the lower jaw. It may be noticed that upon waking speech is quite good before full consciousness is established, but immediately consciousness is restored the power of speech is lost. To combat this it is necessary to bring the overcharged muscles to a normal degree of tonicity by tongue exercises. Facilitation is assisted by the continued slow repetition of verses of poetry.

In the finer movements of the small joints of the hand there is often some loss of power. After relaxation of the proximal muscles has been obtained the patient is encouraged to concentrate on mastering these finer movements. When the child first starts to write his hand should be guided by the attendant. Exercises in which the child has become proficient are not repeated each day; attention is centred on the actions he cannot perform. At intervals of two weeks, however, the full routine of exercises is carried through.

Long hours of sleep are necessary, and the child should never be disturbed from his rest, because during sleep there is inhibition of the spasm. This is in accord with Pavlov's theory of sleep. Sometimes there is sleeplessness due to painful spasm. The child may make while sleeping an involuntary movement, which becomes immediately a painful spasm which awakens him. The parents must be trained gently to manipulate such spasms, so that the patient sinks back into a quiet sleep.

Treatment of Fixed Deformities

Most fixed deformities will yield to stretching by special apparatus. Inhibition of spasm must be effected first, and the time of stretching must not exceed half an hour each day and should never cause pain. Some few cases of fixed deformity may need tenotomy (only three in our series of 370 patients). No patient under treatment has ever developed deformity. It is therefore essential to place patients under treatment early. The first manifestations of disease occur at 8 months of age, and the first sign is difficulty in abducting the legs. Treatment should be begun at this early age if possible.

Special surgical boots may have to be worn to combat inversion and eversion deformities of the feet. The toe-caps of the boots are removed to allow free movement of the smaller joints, and to stop spasm consequent on compression of the distal receptive areas. Only the heel of the boot should be fully built up, otherwise there will be some interference with the freedom of toe movement.

Other Forms of Treatment

Ramisectomy has now no part in the treatment of spastic paralysis. There is no sympathetic nervous supply to skeletal muscle other than that to the blood vessels in the muscles (Hinsey, *Physiol. Rev.*, 1934, **14**, 562). In our experience ramisectomy is often harmful, the preliminary flaccidity of the muscles lasting only for a short period. Later the muscles regain their spasticity, and by this time the general condition has often deteriorated. Retention or other disturbances of micturition may follow.

Stoffel's operation of partial section of the motor nerves to a group of muscles, which has been applied especially to the obturator nerve, results at first in a dramatic reduction in muscle tone. Later on, however, the paralysed part of the muscle becomes fibrosed and retracts, spasticity returns, and the proprioceptive muscle sensation is grossly altered. The muscles are even more incoordinate and spastic than before.

The usual re-education by massage and remedial exercises seems to us inadequate. It is only the extreme attention to detail and incessant application that leads to results such as have been obtained in the Kenny clinics. The ideals of treatment of each form of educational therapy are the same—that is, relaxation of the spasm and co-ordinative exercises—but it is in the fulfilling of this desire and in the strict application of detail that the usual routine breaks down. Several clinics, notably in America and England, are striving after the ideal, but they do not go quite far enough and their methods are not sufficiently intensive. For example, one method advocates the training of co-ordination by swimming exercises in a warm pool. The warmth inhibits the spasm, and the water takes the weight off the limb and the stretch reflex is not evoked so easily. This is quite true, but the swimming is an active form of motor education. The effort of movement causes an increase in the central excitatory state and the muscles regain their hypertonicity. Education of the spastic child must start at the simplest actions and gradually progress, just as does a baby. Rhythmic exercises and cycling exercises also start at too advanced a stage, and so defeat their object. A spastic patient may be taught in a short time to ride a bicycle and yet be totally incoordinate in using the lower limbs. Of course a degree of progress is made and good work is being done in these few interested clinics, but elsewhere these patients are often looked upon as hopeless cases.

Illustrative Case Reports

Case 1.—A child, aged 8, of Townsville, Queensland, had had spastic paralysis from birth; labour was prolonged, and the infant very cyanosed. Had orthodox remedial therapy treatment from the age of 1 until the age of 8. On examination in March, 1933, he could not stand up alone, walked on the toes with his feet wide apart, and continuously fell. He was unable to get up after falling. There was incontinence of urine and faeces, and saliva dribbled from the mouth. His speech was explosive, and he could not feed, wash, nor dress himself. He appeared to be subnormal mentally. Contractions of the tendo Achilles and muscles of shoulder girdle were noted, and there was flaccidity of wrists and hands.

By November, 1934, the child was almost normal. He could walk normally, even when blindfolded. Incontinence of urine and faeces was no longer present, and there was no dribbling saliva. He could wash, dress, and clothe himself, and could use a pencil in writing and speak normally.

Case 2.—A youth, aged 18, of Townsville, Queensland, was spastic from birth. On examination in July, 1935, both arms and legs were found to be affected. He could walk, but only with the typical difficult scissors gait. When he sat on a chair there was a spasm of the hamstring muscles, the lower legs would coil underneath the seat, and he would fall forward on his face. He could feed and dress himself only with great difficulty, and saliva dribbled from his mouth.

On re-examination in January, 1937, after eighteen months' treatment, he could walk normally and control his facial

muscles. He could do general work and even fine work with his hands. He now earns his livelihood assembling wireless sets.

Case 3.—A girl, aged 7, of Sydney, New South Wales, whose spasticity was noticed at the age of 4 months, was flaccid until a movement was attempted, and then there was a tremendous explosion of incoordinate muscular energy. Her hands would be retracted to the back of her neck. Oculogyral spasm was present, dribbling of saliva, and incontinence of urine and faeces. She was thought mentally subnormal, but had treatment from the age of 4 months up to 7 years, when she was given up and regarded as hopeless. She was then treated privately for the following three years, during which time she learnt to read and write, and to sing and play the piano, and could walk with the aid of a stick. Treatment then ceased for ten years. Has had six months' further treatment in 1936, subsequent to the opening of a clinic in Brisbane, and can now walk without the use of a stick.

Case 4.—A child, aged 4, of Brisbane, had paralysis of a mixed flaccid and spastic type from birth. There was marked spasticity of the legs, but flaccidity of neck and arms. This patient was unable to lift his head from his chest, had incontinence of urine and dribbling of saliva, and could not speak. Though pronounced an idiot, he was admitted to the Brisbane clinic in June, 1935.

On re-examination in January, 1937, he could hold his head up normally, and was beginning to speak and feed himself. Fixed contractions of the hamstrings were being reduced gradually. The incontinence of urine and dribbling of saliva had stopped, and intelligence was quite good. Treatment has been continued.

Case 5.—A patient from Townsville had marked astereognosis associated with spasticity. In 1934 the patient had sustained severe head injury, for which decompression was performed. A flaccid paralysis of the right leg cleared up, leaving spastic paralysis of the right face and arm associated with extreme astereognosis. He could not discriminate between a golf ball and a small nut placed in the hand. He had standard remedial therapy for one year without any improvement, but recovered completely after clinic treatment for twelve months.

Case 6.—A child, aged 18 months, had been spastic from birth; the prognosis was regarded as hopeless, and spastic contractions of the arms and legs were already developing in spite of treatment. Dribbling of saliva was present. Babinski responses were present with ankle clonus on both sides. Treatment for twelve months resulted in marked improvement. The reflexes are now normal, there is no dribbling of saliva, and the patient is much brighter mentally. We believe that this child will be normal by the age of 7.

Results of Treatment

The patients we have dealt with on the lines indicated above have been the very worst spastic cases. Even the very worst patients, who on examination appeared to be idiots with marked spastic contractures, have sometimes proved to be of quite normal intelligence and capable of the finest co-ordinative movements such as those involved in dancing and piano playing. Two hundred cases have been treated. Many of them are the rejects from all over the world, and at the beginning of the work only those cases that were pronounced hopeless by a medical committee were treated. No published results we know of can compare with those achieved in Australia.

The treatment requires, above all, energy, enthusiasm, and the maintenance of a cheerful outlook. These factors are best achieved where trained persons are working together, competition and similarity of ideas sustaining the mutual interest. It is found in the clinics that two years' training in both flaccid and spastic types of paralysis is essential before real proficiency is attained. At the end of this time the trainees are examined, and if successful are granted the clinic diploma.

The notes on special exercises have been taken from Elizabeth Kenny's *Infantile Paralysis and Cerebral Diplega* (1937, Sydney).

BIBLIOGRAPHY

Liddell and Sherrington (1925). *Proc. Roy. Soc.*, B, **96**, 212; **97**, 267.
Pavlov (1927). *Conditioned Reflexes: An Investigation of Physiological Activity of Cerebral Cortex.*
Wright, Sampson (1936). *Applied Physiology*, sixth edition.

Clinical Memoranda

Ileo-caecal Volvulus in a Mental Patient

It is well known that anomalies in the later stages of intestinal development give rise to conditions in the right side of the abdomen which may lead in later life to a variety of morbid consequences (Waugh, 1920). According to Dott (1923), normal fixation and downward elongation of the ascending colon occurs during the third stage of rotation of the gut, at or about the twelfth week of intra-uterine life. In a proportion of cases, however, deficient fixation and excessive downward elongation of the caecum and ascending colon takes place at this stage of development, giving rise to a mobile colon so that the caecum may occupy one of many abnormal situations. The case reported is an instance of acute obstruction developing as the result of an unduly mobile caecum (Marnoch, 1913–14).

CASE RECORD

The patient was a single woman, aged 40, of poor physique and nutrition, and with a history of pulmonary tuberculosis since adolescence, who was admitted to the Murray Royal Mental Hospital on April 19, 1936, in a state of acute agitated depression.

In December, 1936, as a result of refusal of food, she began to lose weight rapidly, and had to be tube-fed twice daily. On January 21, 1937, during the epidemic, she developed influenza, with a subsequent lighting up of the old tuberculous pulmonary lesion, and from then until the date of her death she ran a remittent pyrexia. During this period she became markedly emaciated.

At 6.30 a.m. on February 16, on returning to bed from stool, she complained of severe pain in the lower abdomen. On examination the abdomen was tender and tense, and there was a large tympanitic swelling occupying the right iliac fossa and hypogastrium, and extending almost to the umbilicus. The patient was restless and obviously in great pain. She collapsed and died at 11.55 a.m. Although a tentative diagnosis of acute intestinal obstruction was made, it was considered that operative intervention was not justified on account of the patient's extreme weakness and acute phthisis.

Post-mortem Findings.—On opening the abdomen the grossly distended caecum, dark purple in colour but still lustrous, filled the lower right portion and extended well over to the left side. The volvulus was reduced with great difficulty, and it was then found that the lowest four feet of ileum had passed anterior to the displaced caecum and become incarcerated in the pelvis. This portion of small intestine was, like the caecum, intensely congested and gangrenous. The mesentery of the lower ileum was continued on to the caecum and ascending colon. There were several old tuberculous scars in the lower ileum, one of which, one inch proximal to the affected bowel, formed an annular cicatrix which considerably narrowed the lumen. The large intestine distal to the volvulus was collapsed, and there was a notable absence of intra-abdominal fat. Both lungs were extensively affected by tuberculosis, but the other viscera showed no evidence of disease.

It is probable that the events leading to the condition occurred in the following sequence. Mobilization of the

intestine in this case was no doubt exaggerated by the somewhat rapid absorption of fat from starvation and phthisis. When the patient got out of bed the whole ascending colon probably sagged, until, together with the caecum, it assumed the shape of the letter J. It is then easy to imagine how a loaded or distended ileum might be forced down into the pelvis by the effort of straining at stool. By reason of the attachment of the abnormal mesentery, the downward displacement could take place only anterior to the caecum, and thus produce a volvulus.

We wish to thank Dr. W. D. Chambers, physician-superintendent, Murray Royal, Perth, for his kind permission to publish this case.

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REFERENCES

Dott, Norman M. (1923). *Brit. J. Surg.*, **11**, 251.
Marnoch, John (1913–14). Ibid., **1**, 644.
Waugh, George E. (1920). Ibid., **7**, 343.

An Unusual Cause of Volkmann's Ischaemic Contracture

A boy, aged 8, while playing fell on a nail, which penetrated the volar aspect of the right forearm just below its middle; a dressing was applied at his home, but on the fourth day the temperature rose and pus exuded from the puncture. He was taken to the surgical out-patient department, where anti-tetanus serum was given and the wound cleaned. He attended for dressings regularly for fourteen days, by which time the wound had closed. It was observed, however, that he was developing a contracture of the fingers; consequently he was transferred to the section for orthopaedics.

Showing extension of fingers on flexion of wrist; also scar of puncture.

CONDITION ON EXAMINATION

There was no evidence of wasting in the forearm. A small closed bluish spot with a slight halo around it was seen on the ventral aspect of the forearm. This spot, with about one inch of skin around it, was attached to the underlying deep fascia. The muscles in the middle third of the forearm around the wound were found to be indurated. Sensations were not diminished, and pronation and supination were not affected. The hand showed a typical deformity of Volkmann's ischaemic contracture. On attempting to extend the wrist the metacarpo-phalangeal joints became dorsiflexed, whilst the interphalangeal joints became flexed and resisted forcible extension.

The patient was admitted to the wards, and after attempts at manual correction it was found advisable to intevene surgically, and the operation of stripping the flexor muscles from the internal epicondyle of the humerus was performed. The incision was extended further downwards to the site of the scar.

OPERATION

Macroscopically the muscles at their origin looked healthy; lower down in the middle third the deep fascia was fibrosed and hard, a specimen of this being removed. The muscles underneath looked brown and oedematous, and a piece was taken. The hard epitrochlear gland found in the upper part of incision was also removed, and all three specimens were sent for miscroscopy. The fingers were then stretched and were individually placed on finger-splints. The whole hand was now hyperextended and placed on a cock-up splint. The wound healed by first intention. After regular massage and stretching the patient was discharged one month later and attended as an out-patient. The splints were removed a month later, the hand having regained its normal movements. He was seen regularly once a week for three months, when he was discharged as cured.

The specimens taken were examined by our chief pathologist, Dr. H. Barsouma, who reported:

"1. *Deep Fascia.*—This is thickened, as also are its blood vessels. There is a fair amount of round-cell infiltration (plasma cells and lymphocytes), especially perivascular in distribution.

"2. *Muscle.*—There is a definite increase in the fibrous tissue between the muscle bundles, with a slight amount of small round-cell infiltration. The muscle fibres themselves show a certain degree of hyaline change.

"3. *Lymph Gland.*—This reveals marked fibrosis, especially in the central part; the periphery shows the lymph follicles with their germ centres practically unaffected."

CONCLUSION

Volkmann's ischaemic contracture is nearly always due to a fracture round about the elbow-joint, the determining factor being obstruction of the venous return due to either extrinsic or intrinsic causes—extrinsic such as tight bandaging, and intrinsic such as pressure by blood clot. Brooks and Jepson's work shows the intrinsic cause due to a combination of events: venous obstruction, serum exudation, and swelling of soft structures pressing on vessels and nerves. The unusual origin of the case is a subject for discussion. Brooks and Jepson's theory can be explained in such a case. The sepsis which had set in, the outlet being small, had produced swelling and induration of the soft parts, causing pressure on vessels and nerves, and venous obstruction. Sir Robert Jones, however, has declared that ischaemic contracture is due to acute venous obstruction and does not occur where the obstruction is gradual. Here also the original puncture might have injured the vein and produced clotting, which extended to the main vein, causing acute venous obstruction.

The interest of this case presents itself not only in the most unusual cause but also from the medico-legal point, for it shows that ischaemic contracture may take place in a forearm irrespective of fracture or compression by bandage or splint.

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Reviews

INTERRELATION OF DIGESTION AND HEALTH

Digestion and Health. By Walter B. Cannon. (Pp. 160; 14 figures. 6s. net.) London: Martin Secker and Warburg. 1937.

Professor W. B. Cannon, who has contributed greatly to the better understanding of the physiology of digestion, has had the happy idea of rewriting in popular form the lectures which he gave at the centenary celebrations of Beaumont's classical work, and publishing them in an interesting book on the interrelation of digestion and health. William Beaumont, a Connecticut Yankee serving as a United States Army surgeon, persuaded a former patient to come and serve him. This man had had a severe gunshot wound of the left upper abdomen, resulting in a gastric fistula. During the years of their relationship as master and man, physician and patient, Beaumont made a series of observations on the gastric secretion of his patient under varying conditions of health and illness, temperance and intemperance, placidity and anger, which laid the foundation of a sound knowledge of stomach digestion. Since his student days Professor Cannon has been interested in, and prosecuted researches into, the physiology of digestion, and has particularly contributed to the application of *x* rays to the understanding of digestive problems. His Beaumont Lectures on "Some Modern Extensions of Beaumont's Studies on Alexis St. Martin" contained an account of these and related researches, and are now submitted in a more popular form in the book under review.

Beaumont's early observations showed that the sight or smell of appetizing food not only caused the mouth to water but brought about a flow of gastric juice as well. Hunger is associated in our minds with an ache or gnawing pain referred to the lower chest region. It is not a general sensation; it does not even increase progressively if one goes without food; hunger strikers cease to feel hungry after a few days. It is a pang which has been shown to synchronize with contractions of the stomach. These contractions, more or less rhythmical, are influenced in various ways. They are stilled by taking of food. Sleep does not check them; indeed, they may interfere with sleep and produce restlessness. Chewing movements will stop hunger pangs. Not only swallowing, but great emotional excitement arrests the digestive functions, checking the muscle grippings associated with hunger. Smoking weakens and may completely stop them; strong alcoholic beverages have the same effect. Vigorous exercise inhibits them, probably by contraction of the abdominal wall such as follows tightening the belt. Why the stomach when empty contracts with so much greater power than when engaged in digesting a meal is probably associated with the blood content of glucose; the injection of insulin, which is succeeded by a fall of blood sugar, is a valuable stimulus to hunger in patients who are enfeebled or ill. Thirst appears to be a different phenomenon, though it can be even more insistent, more intense than hunger, and lead more rapidly to distress and death. The feature of thirst which practically all observers agree upon is the unpleasant sensation of dryness in the mouth and throat. Cannon's theory is that when the water supply of the body begins to run low from dry external conditions, excessive sweating, profuse diarrhoea, the salivary glands, because they require water to produce saliva, are particularly affected. If they fail to pour out their product in sufficient amount the back of the mouth becomes dry and sticky, and thirst is experienced. The theory is substantiated by experiments showing that all methods used to lessen the water content of the body—sweating, haemorrhage, and avoidance of drinking—were accompanied by a reduced output of saliva.

Digestion is of course essential for the maintenance of bodily vigour. Ordinarily we are only vaguely aware of the processes of digestion occurring inside us. When well supported and permitted to have their own way the stomach and intestines do their work well. Most of their difficulties come from the outside. Stress or emotion may bring about an abolition of movements in stomach and intestines. Cannon relates this to the extrusion of adrenaline into the general circulation as a result of pain, fear, and preparation for fight or flight which he has previously drawn attention to, since adrenaline, by stimulating the sympathetic nerve endings, brings about an inhibition of movement in stomach, intestine, and colon. He quotes a patient of Alvarez who continued ill for a week with much disturbance of digestion and only recovered when the doctor learned that she was worried about a bill and, as a therapeutic measure, paid the bill. This is the only sentence that could be taken exception to in recommending this admirable book to the general public for perusal.

PHARYNGEAL DISEASES

Les Maladies du Pharynx. Clinique et Thérapeutique. By G. Canuyt. Avec la collaboration de MM. Reverchon and Truffert, et le concours de Ch. Wild. (Pp. 790; 216 figures. Broché, 180 fr., cartonné toile, 200 fr.) Paris: Masson et Cie. 1936.

The pharynx might appear a somewhat restricted region to be made the subject of an immense volume of nearly eight hundred pages, but Professor Canuyt has undertaken this great task with the collaboration of the late Professor Reverchon of Lille, Dr. Truffert of Paris, and Dr. Ch. Wild, his own pupil at Strasbourg. They have had other assistance in special chapters. Professor Gery writes fully on the histopathology of tumours, Dr. Gunsett on treatment by radiation, and several others contribute sections on the relation of diseases of the pharynx to general medicine. It need scarcely be said that in a work so immense the subject is approached from the broadest standpoint, and special sections are devoted to the teeth, and especially to disorders connected with and arising from the wisdom teeth. There is even a section full of interest and good sense on forensic medicine as it concerns the specialist; this appears to indicate an increasing disharmony between Medicine and the Law in France, and it is presumably therefore all the more necessary to call attention to risks and liabilities whereby harsh penalties may be incurred.

The inflammatory diseases af the pharynx, nasopharynx, and tonsils are naturally described in great detail. It is interesting that there is a strong inclination to the view that Vincent's angina does not exist as a pathological entity, but is an epiphenomenon which masks some other pathological condition. Paul Chevalier is quoted to the effect that there is always some underlying malady. This may perhaps be going too far, but it emphatically calls attention to something which is not always understood in the nature of Vincent's angina. Dr. Truffert is anxious to suppress the term Ludwig's angina because it is not an angina and because Gensoul described the condition completely in the *Journal Clinique des Hôpitaux de Lyon* six or seven years before Ludwig. "Phlegmon septique du

plancher de la bouche de Gensoul" is the nomenclature adopted in this book.

The histopathology of malignant disease receives an elaborate general description, and tumours are described separately under the three rubrics of the tonsil, the nasopharynx, and the laryngopharynx. The various methods of treatment are described in detail, both surgical and physical, but there is a reluctance to quote any evidence on the results obtained. However bad these may be they should be frankly given so that some estimate, however imperfect, may be formed of their value. There is an inclination to resort to simple excision in all operable cases, but the section on the surgery of the laryngopharynx is unexpectedly found to be disappointing.

The authors say that they have tried to avoid "redites," and some repetition in a book so designed is inevitable, but there is much that might have been eliminated without spoiling the form of a magnificent collection of essays. Although the book is rather larger than it need have been, Professor Canuyt and his friends have made a splendid and permanent contribution to French medical literature, and in particular it forms a lasting memorial to Professor Reverchon.

BUCHANAN'S ANATOMY

Buchanan's Manual of Anatomy, Including Embryology. Edited by J. E. Frazer, D.Sc., F.R.C.S. Sixth edition. (Pp. 1,772; 1,042 figures. 35s.) London: Baillière, Tindall and Cox. 1937.

The sixth edition of *Buchanan's Anatomy*, the last issue of which was edited by Professors Wright, Parsons, Frazer, and Barclay-Smith, has now appeared under the sole editorship of Professor J. E. Frazer. The present issue of this work retains much of the original character which has gained for it a well-merited and firmly established place among British textbooks of anatomy. Previous editors have contributed their particular characteristics to the whole, which contains a fund of information not included in any book of the same category, and which is the outcome of many original observations and work of the writers themselves. Professor Frazer's special contribution is the section on embryology, including general embryology and the development of special organs. His treatment of this subject is unique, and he has amply illustrated it by diagrams and rough sketches founded on microscopical sections and his own models of human embryos which aid in effectively explaining the text.

The terminology used in this edition is the revised nomenclature, which has been adopted by the Anatomical Society of Great Britain and Ireland, with the addition of certain of the older historical names which are still in common use. These are usually mentioned once, when the subject is introduced, or recorded in the glossary. The book as a whole may be regarded as conservative in type, and one which is much needed by students of the present time when the traditional methods of the older surgical anatomists are apt to be set aside in order to make room for the introduction of more recently acquired knowledge on special subjects which is perhaps better dealt with in monographs on the particular organs and systems concerned. There are some, however, who would like to see a closer association of microscopical with macroscopical anatomy than is customary and the introduction of good illustrations representing the structure of important organs such as the mammary or lymphatic glands into the textbooks which the student is using at the time when he gains his first acquaintance with these organs in the dissecting room. A closer association of pure with applied anatomy is, moreover, at the present time more than ever desirable, a condition which can only be attained by a combination of a professed anatomist working hand in hand with surgeons or physicians who are actively engaged in professional work.

In conclusion we should like to express our high appreciation of Professor Frazer's valuable contributions to the manual, and more especially the permanent record which he has made in it of so much of his life's work on human embryology. *Buchanan's Anatomy* will be a valuable help, not only to the student as an introduction to the study of anatomy, but also to teachers and practitioners.

BRIGHT'S DISEASE

Bright's Disease and Arterial Hypertension. By Willard J. Stone, B.Sc., M.D., F.A.C.P. (Pp. 352; 31 figures. 22s. 6d. net.) Philadelphia and London: W. B. Saunders Co. 1936.

In this useful book Dr. Willard J. Stone has correlated his notes on the course and progress of his patients with Bright's disease with the literature of the subject. It is found that the diseases of which he treats occupy the third place among the causes of death in the United States. The author is clinical professor of medicine in the University of Southern California, and his book lays main emphasis on the clinical features of the groups of cases which make up the disease. In the past the clinician has often been too much dominated by anatomical and histological considerations, or, on the other hand, has adopted a purely clinical classification without reference to the underlying pathological state. The author has found useful a division of Bright's disease into acute and chronic forms with certain subdivisions. Among the acute forms there may be the usual haemorrhagic type or an acute degeneration following diphtheria, pregnancy, or septicaemia. The chronic forms are arteriosclerotic with primary hypertension, haemorrhagic with secondary hypertension, and degenerative. The discussion of these groups in detail, with a series of illustrative cases, is preceded by chapters on the physiology of the kidney and estimation of renal function. The main symptoms of Bright's disease are dealt with, the phenomena of water balance in the body and its upset in oedema, acidosis and alkalosis, and uraemia. All this is readable and up to date.

The main part of the book comprises a detailed description of the clinical features of renal disease, and may be recommended as a fair discussion of present-day knowledge. The photomicrographs of typical kidney lesions collected at Pasadena Hospital under the author's supervision illustrate well the anatomical basis of the various forms.

THE AUTHOR OF THE PURPLE ISLAND

Phineas Fletcher: Man of Letters, Science and Divinity. By Abram Barnett Langdale. (Pp. 230. 15s. net.) New York: Columbia University Press; London: H. Milford, Oxford University Press. 1937.

The Purple Island is full of interest to medical men, yet few have read it and fewer still could pass an examination on the life of Phineas Fletcher (1582–1650), who wrote the poem. Isaac Walton recommended him "as an excellent divine and an excellent angler. The author of the Piscatory Eclogues in which you shall see the picture of this good man's mind, and I wish mine to be like it." But it is *The Purple Island* which is of especial interest to doctors, for it deals allegorically with anatomy and physiology, and it would be interesting to ascertain how Fletcher came by the knowledge of his facts. Mr. A. B. Langdale points out that it contains things new and old. Phineas was almost exactly contemporary with Dr. William

Harvey, the discoverer of the circulation of the blood; both came from Kent, both were educated at Cambridge, Harvey at Caius, Fletcher a Fellow of King's College. Did they know each other and did Fletcher owe anything to Harvey? Mr. Langdale gives a fair summary, but only incidentally. In the Common Rooms at Oxford and Cambridge there was much good scientific talk during the first half of the seventeenth century. The Reverend John Ward, vicar of Stratford-on-Avon, records in prose some of the things he heard at Christ Church: Fletcher may have chosen to throw his recollections into a more poetical form.

The greater part of Mr. Langdale's book deals with the lineage, life, and surroundings of Phineas Fletcher. For this purpose he has gone to original documents for information, and has visited the villages and places where Fletcher worked and drew his inspirations as a poet, first in Kent, then at Cambridge, and finally in the Fen country. The result is most satisfactory. Phineas is no longer *nominis umbra*, but emerges as a somewhat quarrelsome parson and poet of genius who was indebted to Virgil, Ovid, and Spenser. Mr. Langdale is just but rather unkind when he gives in one appendix, "A Tabulation of the Passages in Fletcher's Works revealing Self-repetition," and in another, "The Apparent Sources of Occasional Passages in Fletcher's Works." There is a good bibliography and a sufficient index.

CHRONIC MILIARY TUBERCULOSIS

Chronic Miliary Tuberculosis. By Clifford Hoyle, M.D., M.R.C.P., and Michael Vaizey, M.B., M.R.C.P. (Pp. 140; 18 figures. 12s. 6d. net.) London: H. Milford, Oxford University Press. 1937.

Dr. Hoyle and Dr. Vaizey have had the opportunity of following up ten patients who, on clinical grounds, appeared to suffer from chronic miliary tuberculosis. In only one of the fatal cases, however, was a necropsy carried out. This form of tuberculosis, though extensively studied abroad since 1923, particularly in France, Germany, and Spain, has up to quite recent times attracted no attention in this country. Hoyle and Vaizey therefore undertook the laborious task of reviewing the whole literature of the subject. From the reported cases they collected 110 which to them appeared genuine examples of the condition. The attractively produced little monograph thus contains full details of their own cases and brief notes of the others. Basing themselves on these 120 cases, they describe the clinical and radiological features, the laboratory investigations, the clinical and radiological course, and the morbid anatomy and physiology. They then discuss diagnosis and treatment.

When it is realized that many tuberculosis workers still believe that miliary tuberculosis is rapidly fatal, and that a chest skiagram showing "miliary shadows" amounts to a death verdict for the patient, it will be admitted that the authors deserve our thanks for bringing chronic miliary tuberculosis so effectively into the clinical field in England. But there is at the same time a real danger in the publication of their work as a monograph. Chronic miliary tuberculosis is but one rare form of chronic disseminated tuberculosis, which in some degree or other plays an important part in the natural evolution of tuberculosis as a disease in nearly every individual. The danger, therefore, is that the effect of this book may be to focus attention not on the study of the development of the disease as a whole and on the importance of the chronic disseminated phase, but on the clinical aspects of chronic miliary tuberculosis alone.

To one error in the book we must draw attention. Pagel and Henke did not "emphasize minute cavities as a particular feature"; what they described was a special form of chronic disseminated tuberculosis associated with extensive small emphysematous bullae caused by the shrinking miliary nodules. This is so distinctive that Pagel has given a separate name to this condition—"disseminated emphysematous tuberculosis."

Notes on Books

A second edition has now appeared of Sir LANCELOT BARRINGTON-WARD'S *Abdominal Surgery of Children* (H. Milford, Oxford University Press, 25s.). This well-produced book, founded on the author's work at the Hospital for Sick Children, Great Ormond Street, was reviewed on its first appearance in our issue of March 31, 1928. Some chapters have been rewritten, others amplified, and all have been revised. Brief appendices now appear on anaesthesia and on intravenous saline therapy, the one by Dr. Niel McDonald, the other by Mr. J. C. R. Hindenach.

Volume i of the official *Report of the Ninth International Congress of Military Medicine and Pharmacy* has now been published. It contains the papers read at Bucarest last June and summaries of their contents in various other languages are appended. The topics dealt with in this volume include: the organization and functioning of the health services in combined operations by land and sea forces; the transport, hospitalization, and treatment of gas casualties; the organization and functioning of the surgical service in the case of mobile troops; the employment of colorimetric methods in analytical investigations in laboratories; the question of the dentally inefficient in peace time and warfare, including the provision of dentures and other treatment; and the special methods of feeding the sick and wounded required by various circumstances arising both in peace and in war. This volume presents a comprehensive review of modern methods of dealing with some urgent questions of the day, and is of unusual importance even outside the medical circles of the fighting forces.

Principles of Pharmacy, by Professor H. V. ARNY and Dr. R. P. FISCHELIS, is a well-established textbook; it first appeared in 1909, and has now reached a fourth edition (W. B. Saunders, 35s.). This volume of some 1,000 pages is divided into six parts, which deal with pharmaceutical operations, the galenical preparations, inorganic and organic chemistry, pharmaceutical tests, and dispensing. It thus provides a systematic survey of the knowledge needed by the student of pharmacy. The short history of pharmacy contains an interesting analysis of the American drug bill. The total bill is estimated at 715 million dollars. Drugs dispensed by hospitals and doctors account for only 7 per cent. of this total, while drug store sales are reckoned as 87 per cent., one-quarter of the latter representing the sum spent on prescribed remedies, and three-quarters that spent on self-medication. The sale of "patent medicines" in the U.S.A. is estimated at 335 million dollars. The final section, on dispensing, also contains much of common interest to the professions of medicine and pharmacy, since it discusses at some length the dispensing of illegible prescriptions and of prescriptions containing hopeless incompatibilities or probable errors in dosage. In general the volume gives a very clear account of its main subject and much information in a wider field.

The Johns Hopkins Press of Baltimore has reprinted the German original of Paul Langerhans's *Contributions to the Microscopic Anatomy of the Pancreas*, with an English translation and introductory essay by Dr. H. Morrison. The price of the book is 4s. 6d., and it is obtainable in this country from the Oxford University Press.

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RAMON Y CAJAL: HIS CONTRIBUTION TO MEDICINE

The recent issue by the American Philosophical Society of Santiago Ramon y Cajal's autobiography, translated into English by Dr. E. Horne Craigie,[1] should appeal to a far wider circle of readers than that composed of neurologists and laboratory workers. The story is one of a man of exceptionally strong personality, who forced his way into international fame, in spite of an unfavourable environment, by unremitting toil controlled by the full power of his intelligence. It is not to be inferred, however, that the acquisition of fame was the goal of his ambitions; it was a by-product that often caused some anguish of mind when, by the award of some high international honour, his work was badly interrupted. Cajal's love of country nevertheless compelled him to accept such honours, and even, in the earlier stages of his career, to seek recognition abroad when he found that papers published in Spanish were not read by the medical world.

For lack of space the fascinating story of Cajal's life cannot be outlined here. The first volume of his autobiography is devoted to his early life, and in it he describes his boyish escapades and his harsh upbringing as well as many interesting details of life in Spain. His career might be said to have started when in 1877 he was installed at Zaragoza as auxiliary professor in anatomy and began to turn his attention to histology. It is astonishing to learn that teachers in biology and pathology habitually disregarded the microscope at that time, the instruments being kept carefully locked up in their cases. It is characteristic of Cajal that he not only used the microscope fully, but spent his hard-earned savings in buying the best instrument available. His interest in the histology of the central nervous system was shortly afterwards aroused when Simarro, the famous neurologist of Valencia, showed him some Golgi preparations. Cajal was already an amateur photographer of much ability, and it may be assumed that his knowledge of the chemistry of silver salts inspired his application of this new metallic method to the problems of histology. At all events he wasted no time in trying it in his own laboratory and in carrying it through modifications that yielded finer results than any obtained before. In particular he found that embryological material provided especially beautiful and clear results. Publications now followed one another in rapid succession. Unfortunately, however, these attracted little attention abroad, and their author realized that he must make his results known by other means. A vital step was taken in 1889, when he demonstrated his preparations at a meeting in Berlin of the German Anatomical Society. He describes how the supercilious attitude of the gathering towards a mere Spaniard and his work was transmuted to admiration through the single-minded generosity of Kölliker, who, in spite of his age and supreme eminence at that time, could take the trouble to examine and appraise the work of this newcomer. The support of this great man was of the greatest consequence: it meant acceptance by the world outside Spain, and Cajal's public was assured for all future publications. Honours followed—the Croonian Lectureship in this country in 1894, accompanied by the conferment of an honorary degree at Cambridge, and a lectureship in the United States in 1899 form but a small part of the distinctions which culminated in the award of the Nobel Prize in 1906. Cajal died in 1934 at the age of 82.

His contribution to medical science falls into two main divisions. First and foremost stands his work on the histology of the nervous system. He demonstrated this with a clarity that had never before been achieved, using modifications of the silver technique introduced by Golgi. The theoretical consequences of this work were of great significance. His results led Cajal to endorse wholeheartedly the neurone theory of Waldeyer, the supporters of which held that the propagation of the nervous impulse took place through contact between the processes of adjacent neurones. This was opposed by the supporters of the so-called "reticular" hypothesis, which postulated that propagation of the nervous impulse depended upon the continuity of cytoplasm between neighbouring neurones, which thereby formed a kind of syncytium. The controversy between these two schools was long and bitter; it was largely due to Cajal's vigour and the precision of his results that the neuronist eventually held the field. Much of the argument centred around the changes which take place in the nerve fibres in Wallerian degeneration and the subsequent regeneration of these fibres. This subject was studied in minute detail by Cajal,

[1] *Recollections of My Life: Santiago Ramon y Cajal.* Memoirs of the American Philosophical Society, vol. viii, Parts I and II. 1937. London: H. Milford. (22s. 6d.)

and we are fortunate in having an English version of this work.[2] It is well known that regeneration of nerve fibres fails to take place within the central nervous system: the abortive attempts made towards this end and the regression of the sprouts put forth from the central stump are described in these two volumes.

The structure of the neuroglial elements of the central nervous system and their demonstration by the famous gold chloride sublimate method are perhaps more often associated with Cajal's name than his earlier studies on the neurones, although it is clear from his autobiography that the latter were regarded by him as his principal achievement. However, the application of these new glial methods to embryological material revealed a series of developmental changes in the morphology of the neuroglial cells that was later adapted by Bailey and Cushing to the study of the gliomata. It was found possible to classify these tumours into types corresponding to stages in the embryological development of the neuroglia, a brilliant piece of work that has proved to be of practical as well as of academic importance, since upon it depends all modern work in neuro-surgery. It has now been abundantly demonstrated that both prognosis and treatment of the gliomata depend upon histological identification of the tumour disclosed at operation; some require radical removal whilst others are better treated by irradiation.

The last stages of Cajal's career saw him established as an acknowledged master with a school of energetic and often brilliant pupils in a magnificent institute provided by a grateful Government. In the present unhappy state of Spain all this has inevitably come to a standstill. We can only hope that means will be found to rebuild the splendid new school when fighting comes to an end, and that this revival may come soon.

[2] *Degeneration and Regeneration of the Nervous System.* Translated by R. M. May. Two vols. 1928. London: H. Milford. (50s.)

THE INTERVERTEBRAL DISKS AND BACK PAIN

As a result of man's erect posture the spine is subject to exceptional stresses and strains. It must be strong and at the same time supple, a requirement which has been met by the specialized structure of the intervertebral disks. These disks are made up of three components: (1) cartilage plates adapted to the upper and lower surfaces of adjacent vertebral bodies; (2) the fibrous annulus; and (3) the nucleus pulposus, which represents the remains of the chorda dorsalis (notochord) and is enclosed by the fibrous ring. In 1896 Theodor Kocher[1] reported a case of rupture of the intervertebral disk between the first and second lumbar vertebrae in a young man who had succumbed to multiple injuries after falling from a height of one hundred feet and landing in the standing position. There was no fracture of the spine. This was one of the first cases to arouse interest in intervertebral disk lesions. A comprehensive radiological study of the chief lesions which we now know to affect the disks has recently been made by A. Craig Mooney.[2] One of the most interesting of these lesions, and one that has attracted much attention recently, is the extrusion of disk substance into the spinal canal. The extrusion consists of a herniation of nuclear tissue through a fissured annulus. The restraining action of the posterior longitudinal ligament affords some protection to the contents of the spinal canal, but this is not always enough: the herniation may project into the canal and, becoming vascularized from the spongiosa of an adjacent vertebral body, undergo calcification or ossification.

Herniation of the intervertebral disk has been recognized only quite recently, though for many years cases have been recorded in which the spinal cord has been compressed anteriorly by what have been regarded as chondromas originating in the intervertebral disks. Masses projecting backwards into the neural canal have also been variously described as myxochondromas, fibromas, loose cartilages, fibrochondromas, Schmorl's nodules (Knorpelknötchen), etc., and it is highly probable that all of these have in reality been examples of disk herniation in which the extruded pulposus has, in some cases at least, undergone secondary changes. Alajouanine and Petit-Dutaillis[3] drew attention to the condition in 1930. In 1934 W. J. Mixter and J. S. Barr[4] of Boston, Massachusetts, gave an account of nineteen cases of herniation of the nucleus pulposus into the spinal canal with compression of the cord or cauda equina. In the same year M. M. Peet and D. H. Echols[5] reported two further cases, and more recently W. J. Mixter and J. B. Ayer[6] have collected a series of thirty-three examples of the condition. Further accounts are also given this year by J. S. Barr[7] and P. C. Williams.[8] The commonest site of the lesion is between the fourth and fifth lumbar vertebrae. The patients present themselves with low back pain and loss of mobility of the lower part of the spinal column, symptoms which

[1] *Mitt. Grenzgeb. Med. Chir.*, 1896, **1**, 415.
[2] *Brit. J. Radiol.*, 1937, **10**, 389.
[3] *Presse méd.*, 1930, **98**, 102.
[4] *New Engl. J. Med.*, 1934, **211**, 210.
[5] *Arch. Neurol. Psychiat.*, Chicago, 1934, **32**, 924.
[6] *New Engl. J. Med.*, 1935, **213**, 385.
[7] *J. Bone. Jt. Surg.*, 1937, **19**, 323.
[8] Ibid., p. 343.

lead these patients more frequently to the orthopaedic clinic, the physician, or the gynaecologist than to the neurological surgeon. There may be complaint of pain radiating into the buttock and down the leg suggestive of sciatica, and sensory and motor signs so slight as to be overlooked, with little more than some loss of sensation and a depression of the ankle-jerk. A curious clinical feature is the fact that the symptoms are not constant and that remissions occur. Pain is the most constant and prominent symptom, and it has been suggested that although the disk itself has no nerve supply the posterior longitudinal ligament, which takes the strain, is supplied with sensory nerve fibres. Diagnosis is confirmed by cerebrospinal fluid studies and radiography after the introduction of lipiodol—by a technique which requires the use of a larger quantity of oil than usual and a tilting *x*-ray table. It is noteworthy that plain *x*-ray photographs of the spine generally fail to show the abnormality.

An important question is the relation of this condition to injury. A rupture of the annulus fibrosus or of the cartilage plate must presumably take place before extrusion of the nucleus pulposus can occur, and a history of antecedent injury was obtained in nearly 80 per cent. of the cases from the Massachusetts General Hospital. Mixter and Ayer remark that the discovery of this new clinical and pathological entity introduces a fruitful source for industrial and accident compensation. The most common cause of injury in the recorded cases has been the lifting of heavy weights, and injury to intervertebral disks has also been reported by C. N. Pease[9] as a result of lumbar puncture. Paraplegia has followed spinal manipulation of these cases, presumably by increasing the herniation. Any attempt, therefore, to suggest that this disk herniation may be that pathological process undemonstrable by *x* rays but held by the osteopaths to be the basis of their practice and corrected by it is quite untenable. Treatment by laminectomy and removal of the herniated mass, either by an extradural or intradural route is claimed to give uniformly good results. Spinal fusion may also be required if the laminectomy has been extensive and has necessitated the removal of one or more of the articular facets. Among the large group of patients variously labelled as cases of radiculitis, lumbago, sciatica, fibrositis, myalgia, and backache of apparently gynaecological origin it is not improbable that some may be suffering from disk lesions. Many of these patients with low backache are a bane to the life of a busy practitioner, and he should bear in mind the possibility that the lesion causing the pain may be herniation of a disk.

[9] *Amer. J. Dis. Child.*, 1935, **49**, 849.

THE PANCREATROPIC HORMONE

The presence in the anterior lobe of the pituitary of hormones which act on the other ductless glands is now generally recognized, but it is by no means clear what effect the pituitary has on the pancreas. One group of workers hold that an anterior pituitary hormone stimulates the islets of Langerhans and may even lead to an increase in islet tissue. Another group speak of a diabetogenic or anti-insulin hormone, and state that pancreatic diabetes (in depancreatized animals) will not occur in the absence of the anterior pituitary. The former group claim to have demonstrated that injection of anterior pituitary extracts produces a fall in blood sugar and a multiplication of islet cells. The significance of such a finding, if confirmed, is obvious. According to one view the islet cells, once they have developed during foetal life, lose all relation to the surrounding parenchyma and lead a separate existence as true endocrine glands, with a layer of connective tissue separating them from the acinar cells of the pancreas. Another view is that the islets arise by differentiation of pancreatic acini, that they function for a time as endocrines, and later return to their previous exocrine function. Yet a third theory regards the islets as arising from the centro-acinar cells of the pancreas. The histologist Maximow says: "It seems fairly well assured that the pancreas, even in the adult, is provided with undifferentiated cells which can give rise to new acini and, to a great extent, to new islands." Morphologically, therefore, there is no strong reason why new islets should not be formed in the diabetic—unless it is just this power of regeneration which is lost. Anselmino and Hoffman, in their original work, used extracts of fresh anterior pituitary lobes and obtained rapid new formation of islets and increase in size of those already present; but they did not indicate whether the new formation was due to metaplasia of acinar cells or to division of already existing islet cells. In a recent publication Chrzanowski and Grzycki[1] report results obtained from the injection into rats of aqueous extracts of anterior pituitary. Such extracts produced no effects on either the islet or the acinar tissue of the rat pancreas, nor was there any evidence of the new formation of islets. But on passing the aqueous extracts through an ultrafilter and treating the ultrafiltrate with an acetate buffer solution of *p*H 5.2, and submitting it to further ultrafiltration, they obtained a filtrate which on neutralization had a marked effect on the rat pancreas. A few injections produced a loss in the normally sharp contours of the islets, with a definite increase in islet tissue. The authors state that under the influence of these injections there was clear evidence of new formation of islets, and adjoining ones could be seen in the process of joining together by a bridge of newly formed tissue, the latter rapidly undergoing mitosis until a giant islet was formed. The parenchymatous tissue appeared to be unaffected. The new islet tissue is stated to originate from certain isolated, lightly staining parenchymatous cells, and to a less degree from the centro-acinar cells. Chrzanowski and Grzycki attribute the inactivity of the aqueous extracts to the inhibitory

[1] *Klin. Wschr.*, April 3, 1937, p. 485.

action of another pituitary hormone, probably the anti-insulin hormone described by Lucke, which can be separated from the pancreatropic hormone by ultra-filtration. These results, in essence, confirm the claims of Anselmino and his co-workers. It is interesting, however, to note that another communication from the same university[2] categorically denies that extracts of beef pituitary, prepared by the method of Anselmino and his colleagues, contain a pancreatropic hormone. The extracts were administered twice a day to rats, guinea-pigs, and rabbits for periods up to eight days, and the blood sugar and the histology of the pancreatic islets were both studied. In no case could evidence of a pancreatropic hormone be obtained, and the authors ascribe the findings of other workers to the variability of the form and distribution of the islets. As to the production of giant islets, they state that these are found in the glands of untreated animals. It is clear that the difficulty is one of rigid control, but the weight of evidence would seem to be on the side of those who claim the existence of the pancreatropic hormone.

NERVOUS MECHANISMS IN ANGINA

In the differential diagnosis of coronary occlusion pulmonary embolus has sometimes to be considered, for pain or oppression in the chest, dyspnoea, cyanosis, and shock are common to both. A previous history of effort angina would suggest myocardial infarction; and any obvious thrombophlebitis or a recent abdominal or pelvic operation would support the diagnosis of pulmonary embolus, as also would the predominance of dyspnoea and cyanosis over pain. The electrocardiogram may also help, but it is well known that in pulmonary embolism it may show changes indicating altered myocardial function. It is held by D. Scherf and E. Schönbrunner[3] that these result from a reflex coronary constriction from impulses arising in the lung and conveyed along the vagus, and apparently on their view the discomfort or pain in the chest is due to coronary constriction. Explanation of these effects on the basis of anoxaemia caused by the pulmonary obstruction is rejected, as they claim to find changes in the electrocardiogram even with a small embolus. In experiments on ten dogs they found alteration of the T-waves after lung embolism in three, alteration of the QRS complex in four, and no change in the remaining three. Division of both vagi before the experiment is said to prevent any change in the electrocardiogram, and also to lessen the severity of the symptoms after pulmonary embolism. The practical application of this work is, according to the authors, in the use of nitrites in pulmonary embolism to relieve coronary spasm resulting from the pulmo-coronary reflex. Confirmation of Scherf's and Schönbrunner's observations appears desirable before their recommendation is accepted. Observations after total thyroidectomy in cases of severe angina throw some light on the nervous pathways concerned in this condition. That pain was relieved so soon after operation that it could not be attributed to a lowered metabolism suggested that injury to some of the cardiac nerves in the neck accounted for this—an explanation that was strongly supported by the fact that after hemithyroidectomy the relief was limited to the operated side. A clinical investigation of the problem and anatomical dissections to determine the nervous relations of the thyroid gland have been made by A. A. Weinstein and H. E. Hoff.[4] In three patients they mapped out areas of superficial and deep hyperaesthesia on the chest wall, and by constant testing during operation under local anaesthesia they demonstrated that this hyperaesthesia disappeared either at the moment the gland was shelled out from its bed, when the inferior thyroid vessels were ligated, or when the stellate ganglion was injected with novocain. The choice of patients for this demonstration does not seem to have been very suitable: all three had rheumatic heart disease; only one had angina; and the other two were suffering from congestive failure. The dissection carried out on sixteen cadavers showed that in 70 per cent. the superior cardiac nerve, arising from the superior ganglion of the cervical sympathetic, was closely applied to the posterior surface of the thyroid gland, and that in 20 per cent. the middle cardiac nerve either lay on the gland or was close to the inferior thyroid vessels. Both these nerves are believed to carry afferent fibres from the heart, and their division or injury during thyroidectomy would serve to explain the amelioration of anginal pain sometimes observed immediately after operation. However, like the anatomical relations, the relief is inconstant, and moreover only temporary, either because of recovery in injured nerve fibres or because of compensation by alternative routes. The observations throw light on the nerve paths concerned in angina, although it is clear that they give no encouragement to operations on the cervical nerves undertaken deliberately for the relief of this condition, and such methods have now been generally abandoned.

LICHEN URTICATUS

Few children pass through their infancy without suffering to some slight degree from "heat spots," and in a great many cases these lesions are sufficiently numerous and persistent to call for medical advice. This eruption, which is one of the plagues of childhood, has been labelled with many different names, but the two under which it is most commonly known are lichen urticatus and papular urticaria. The problems of its aetiology and treatment still remain unsolved. It has often been designated teething rash by the lay public, but there is little evidence that it is caused by teething, which is after all a physiological and not a pathological process. Many attempts have been made to prove that it is due to dietetic errors; in fact, it is sometimes known as chronic alimentary urticaria; but this theory is by no means proved, and its various supporters differ greatly in the importance which they ascribe to various factors. Some regard it as due to the ingestion of an excessive amount of carbohydrates; others to proteins; and it has been held that breast-fed infants never suffer from it. These different theories are mutually contradictory. One factor there is that has an undoubted influence—that is, temperature. All observers are agreed that the

[2] *C.R. Soc. Biol.*, Paris, 1937, **124**, 823.
[3] *Klin. Wschr.*, March 6, 1937, p. 340.
[4] *Surg. Gynec. Obstet.*, 1937, **64**, 165.

eruption is much commoner in summer than at any other time of the year, and Hallam has been able to obtain in almost every case complete remission of the eruption, however severe, merely by taking the children into hospital even although they continued to be supplied with their ordinary diet by their parents. It is suggested by Tate that the explanation of the benefit of merely sleeping in hospital is the fact that hospital wards are commonly kept at a much lower temperature than many private dwellings. For many years workers have striven to establish some connexion between lichen urticatus and calcium metabolism, and calcium in various forms has been a favourite remedy with many paediatrists. The results of this treatment, however, have been by no means satisfactory. In recent years it has been established that the parathyroid gland is intimately concerned with calcium metabolism, and Drs. Pilsbury and Sternberg[1] report considerable success in the employment of parathyroid extract given subcutaneously in doses of 10 to 25 units at weekly or bi-weekly intervals. At the same time they also administered internally calcium lactate, calcium gluconate, or dicalcium hydrophosphate, and the usual forms of local treatment. They claim good or excellent results in 85 per cent. of their cases, while in another series in which parathyroid extract was not given only 38 per cent. responded satisfactorily. They ascribe these results to an elevation of the level of the calcium content of the blood and consider that such increase in blood calcium may either produce a sedative effect or may correct some underlying fault in calcium metabolism. They discuss in some detail the theory that the nature of the disease is allergic, but they consider that the evidence in support of such a view is extremely meagre.

HEALTH IN THE UNITED STATES

A recent Bulletin issued by the Health Organization of the League of Nations[2] contains a report by a group of European experts in hygiene setting forth impressions which they gained in the course of a visit to the United States during 1935. The report is mainly concerned with public health in its relation to social problems which have lately been engaging the attention of administrators in the Union. After an introductory reference to the geographical, economic, racial, and other features of the country, notice is taken of the prevalence of certain disease conditions, and the recommendations of the Committee on the Costs of Medical Care are cited. The Federal, State, and local authority agencies for the protection of the public health are passed in formal review. It is observed that in America compulsory pasteurization does not meet with such strong opposition as it has encountered in Great Britain and Denmark. During their stay in Chicago the visitors were confronted with sanitary problems which were new to them, including the existence of by-passes between pure and raw water supplies. Of the articles devoted to selected topics one is concerned with the social security movement, the need for which was thrown into high relief by the economic depression which reached its crisis in 1933. In this connexion the report quotes President Roosevelt's message to Congress. "People," he said, "want decent homes; they want to locate them where they can engage in productive work; and they want some safeguard against misfortune." A committee appointed by the President made useful recommendations, which were substantially incorporated in the Social Security Act of 1935. This Act established a system of Federal grants to States for the promotion of welfare services not only by way of old-age pensions and unemployment allowances but also, in the domain of health, by the development of maternity and child welfare activities and of schemes for crippled, homeless, and neglected children. It made provision also for assisting States and local authorities to establish and maintain adequate general public health standards, including the training of personnel for State and local health work. Another article in the report deals with the teaching of preventive medicine in the medical curriculum. It is stated that there is in America a lively appreciation of the importance of instruction of this kind, but that in the time available to the visitors it was difficult to determine to what extent the idea received practical application. The medical examination of entrants, they say, as carried out at some universities, followed by periodical examinations, may convey to the student's mind some dim suggestion of a preventive purpose, but at certain American medical schools special methods have been devised to bring him face to face with the morbific environment of the patient upon whose case he is preparing his clinical report. He is made to demonstrate to himself that, given adequate preventive measures, his patient in all probability would not have been stricken at that time with the particular disease from which he is suffering. The report adds that this method of "clinical case studies," as it has been called at Vanderbilt and Yale, has had the remarkable effect of inspiring the student of medicine at these universities with enthusiasm for public health.

[1] *Amer. J. Dis. Child.*, 1937, **53**, 1209.
[2] *Quart. Bull. Hlth. Org. L. o. N.*, 1936, **5**, 747.

THE EDUCATIONAL NUMBER, 1937

No. 4000 of the *British Medical Journal*, dated September 4, 1937, will be the annual Educational Number. Its contents, as in previous years, will include a full account of the requirements of the General Medical Council and of the universities and other licensing bodies in Great Britain and Ireland, as well as information about the opportunities offered by the various medical schools and other teaching institutions and the fees charged by each. The details given have been revised and brought up to date by the authorities concerned. These sections, the object of which is to furnish a handy guide to intending students of medicine, are supplemented by articles intended for newly qualified practitioners on such matters as postgraduation study (with special reference to the British Postgraduate School at Hammersmith), the public medical services at home and abroad, tropical medicine, psychological medicine, and the various special diplomas. The opening article for our forthcoming Educational Number, written by Sir David Wilkie of Edinburgh, is entitled "Education in Surgery for General Practice."

ANAESTHESIA IN GENERAL PRACTICE

This is one of a series of articles, contributed by invitation

LOCAL ANAESTHESIA

BY

C. W. MORRIS, O.B.E., M.B., B.S., D.A.

The outstanding feature of local anaesthesia is that it enables a patient to undergo an operation without loss of consciousness—a feature shared with spinal anaesthesia. It is obvious that the retention of consciousness may be both an advantage and a disadvantage. Local anaesthesia, however, supplies the best answer to the patient suffering from some minor surgical complaint who states that he is perfectly willing to undergo the operation but cannot face a general anaesthetic. Owing, however, to the great progress made in recent years in general anaesthetics, in which both the safety and the comfort of the patient have been increased, the employment of local anaesthesia has become somewhat restricted.

With the exception of certain special conditions local anaesthesia finds its chief usefulness in minor surgery. For this reason it is invaluable to the general practitioner. This does not imply that it should be limited to minor surgery, as it is safe to state that every operation can be, and has been, performed under this form of anaesthesia. It still can be regarded as a useful alternative to general anaesthesia for most operations and the anaesthetic of choice for many. A local anaesthetic may with advantage be employed in the following circumstances.

1. Used alone, or after preliminary medication with morphine and hyoscine, in minor surgical conditions such as removal of sebaceous cysts, adenoma, lipoma, excision of scars, removal of small foreign bodies, etc.

2. In more extensive operations: (*a*) when the patient dreads a general anaesthetic; (*b*) when the patient's condition is such that a local anaesthetic would be less dangerous than a general.

3. In combination with general anaesthesia to obtain relaxation and lessen the amount of general anaesthetic given.

4. When the practitioner is single-handed and has to act as both anaesthetist and surgeon.

Contraindications include such conditions as sepsis round the site of the injection and patients who dread being "awake" during an operation. Young children are not considered good subjects, although it is interesting to note that a local anaesthetic is advocated for Rammstedt operations.

Among the advantages are ease of administration, absence of extensive preparation of the patient, freedom from unpleasant after-effects, and last, but by no means least, safety. The surgeon must remember that the patient is not unconscious and that the area of anaesthesia is limited; gentleness must therefore be of the highest order.

Local Anaesthetic Agents

Many drugs are available which appear to give good results. As my experience has been chiefly with novocain that drug only will be referred to here. It may be used in dilutions of 1/2 per cent. to 2 per cent., and unless otherwise stated it will be assumed that 1/2 per cent. is the strength referred to throughout this paper.

Novocain solutions can be repeatedly boiled for sterilization and as much as 200 c.cm. of the 1/2 per cent. solution be injected with safety. The addition of adrenaline hydrochloride (1 in 1,000) in the proportion of three drops to each fluid ounce of the solution gives two advantages: the duration of the anaesthesia is increased, and there is less haemorrhage in the field of operation. Where adrenaline may be harmful on account of its action on the circulation, as in toxic goitre, novocain and "cobefrin" may be used. "Cobefrin" is claimed to have no adverse effect on the circulation, and certainly produces a satisfactory ischaemia.

Instruments and Method

A good syringe capable of being sterilized—one of 10 c.cm. capacity is a handy size—and an assortment of needles ranging from fine hypodermics to those of from two to three inches in length are needed. Longer needles may be used but they are rather more difficult to direct. A "continuous-flow" type of syringe saves time when an extensive area requires infiltration.

Local anaesthesia may be produced by (1) local infiltration, (2) nerve blocking, or (3) a combination of the two. Before the injections are started the patient, if at all nervous or if the area to be infiltrated is extensive, should be given a hypnotic. For adults morphine 1/6 to 1/4 grain or omnopon, if preferred, combined with hyoscine 1/150 grain will prove helpful. The more powerful basal narcotics, as avertin or nembutal, are not as useful as one might suppose, for should the patient be only lightly under these drugs he may resent the discomforts of the infiltration and become restless and difficult to control. The area to be infiltrated, the syringe, needles, solution, and the hands of the anaesthetist must be prepared with the care that is given to any surgical operation.

First of all a wheal is raised in the skin with a fine hypodermic needle at the proximal end of the area requiring anaesthetization; through this wheal a larger and longer needle is thrust and the infiltration carried on under the skin. If the infiltration is done gently and slowly the discomfort is reduced to a minimum. In loose skin the area of subcutaneous infiltration can be followed with ease and the exact spread of the solution accurately determined. Subsequent insertions of the needle should always be through the anaesthetic area, so limiting the pain to the first prick of the hypodermic needle.

While infiltrating, care must be taken to avoid direct injection into the circulation. This may be guarded against by taking the following precautions. As the needle is pushed forward under the skin the plunger should be pressed down to send a stream of the solution before the needle point. This will tend to push aside small vessels and lessens the possibility of injection into their lumen, or of causing a haematoma. When in the proximity of large vessels the plunger should be withdrawn slightly from time to time to see that no blood is aspirated into the syringe. Perhaps the safest way is to thrust the needle to the limit of the area and infiltrate only while it is being slowly withdrawn. It is possible that the failure to observe these precautions have been responsible for the rare accidents which have been reported.

For conditions such as small cysts, or when skin incisions only are required, a single broad line of infiltration is all that is necessary. For larger tumours an elliptical area surrounding the tumour must be infiltrated

and some of the solution placed deep to it as well. A liberal amount of the novocain solution will contribute to the success of the anaesthesia. When a large area has been treated in this way a short wait of from ten to fifteen minutes before operating will allow the solution to soak well into the tissues. Some anaesthetists advocate the gentle massaging of the infiltrated area to assist the diffusion. A pin or towel-clip can be used for testing the degree and extent of anaesthesia obtained and the result noted by watching the reaction of the patient's face. This is better than asking him whether he is hurt, as that suggests pain and increases his apprehension. This subcutaneous infiltration method may be elaborated and applied for a large variety of operations.

For fingers and toes the method is slightly changed; a nerve block is effected by ringing round the base of the digit. Here again a wheal is raised on the dorsal aspect at the base of the finger or toe and the circle of infiltration completed by employing a longer needle. In this case it is safer to use very little, if any, adrenaline with the solution, as the ischaemic effect of the adrenaline is very marked when injected in this way. I have seen a finger apparently bloodless when adrenaline had been injected, and although no ill effects followed, the risk of sloughing must have been considerable. After five to ten minutes the whole finger becomes anaesthetized, and a large number of minor operations may be carried out without pain to the patient. This method of anaesthetizing fingers must not be adopted in cases of whitlow when the inflammation involves the base of the finger.

When General Anaesthesia is Contraindicated

In the second class are included a large number of operations which may be performed under local anaesthesia owing to the condition of the patient contraindicating a general anaesthetic. In this class it is usual whenever possible to give a preliminary hypnotic. Some typical cases will be described.

RIB RESECTION FOR EMPYEMA

Here the patient may be seriously ill from an antecedent pneumonia, or pneumonia may still be present. The portion of rib to be resected is determined, and it is helpful to outline it with an indelible pencil. A wheal is raised at the dorsal extremity of this marked area and a two-inch needle is thrust down till its point touches the surface of the rib. The needle, detached from the syringe for greater mobility, is then pushed down till the lower border of the rib is detected, and the point is then directed into the subcostal groove; 5 c.cm. of the solution is then injected to block the intercostal nerve and render that segment of the chest wall analgesic. The periosteum along the outer surface of the rib is then infiltrated, and finally the skin along the proposed incision is thoroughly dealt with. The infiltration must be sufficiently wide to include the intercostal space both above and below the selected rib. Some three to four ounces of the solution may be necessary to produce complete analgesia.

One warning may be given to the surgeon. The rib must be cleanly cut through and no wrenching or traction made, else pain is transmitted to the unanaesthetized parts of the chest wall.

DRAINAGE OF BLADDER

Another example in this class is the drainage of the urinary bladder in cases of prostatic obstruction. Here again the patient may be in a condition in which a general anaesthetic is not considered advisable. A line of anaesthesia is laid down extending from just below the umbilicus to the symphysis pubis. The skin and fat are thoroughly infiltrated and the linea alba between the two recti injected, and the two muscles as well. As in all operations under a local anaesthetic, should the patient complain of pain while the operation is in progress a pause may be made and the sensitive layer or part directly infiltrated. If the opening of the bladder causes discomfort a syringe full of the solution can easily be injected into its wall.

GASTROSTOMY

An emaciated and cachectic patient undergoing an operation for gastrostomy may benefit by having it performed under a local rather than a general anaesthetic. A subcutaneous band of infiltration is placed along the left rectus muscle, starting from just above the costal margin and extending down to the umbilicus. The rectus sheath and muscle are deeply infiltrated, and an attempt is made to infiltrate the peritoneum below. Should this layer escape the solution and prove painful it may be directly infiltrated during the operation. The stomach wall does not require infiltration and the patient will complain of no pain while it is opened provided there is no undue traction. The solution should be used freely, and as much as four or five ounces may be necessary to obtain good anaesthesia.

TRACHEOTOMY

A tracheotomy or laryngotomy may be easily and quickly performed under local anaesthesia, and in some cases it may be the only anaesthetic that can be given with safety. For this purpose a 1 per cent. solution of novocain and adrenaline should be employed. A subcutaneous band of infiltration is placed down the middle line from the cricoid to the manubrium sterni. Before the trachea or the larynx is opened 1 c.cm. of a 10 per cent. solution of cocaine should be injected between the cartilaginous rings of the trachea, or in the case of a laryngotomy through the cricothyroid membrane. This will help to check the paroxysmal coughing that otherwise occurs when the tracheotomy or laryngotomy tube is first inserted.

THE INGUINAL REGION

For operations in the inguinal region, such as for herniae, varicoceles, and hydroceles, the following technique, slightly modified to meet each operation, will prove serviceable. The usual small preliminary wheal is raised at a point one and a half to two inches internal and above the anterior superior spine of the ilium. Through this wheal a larger needle is thrust downwards and outwards towards this bony point. Some 20 c.cm. are injected deeply under the aponeurosis of the external oblique and down between the internal oblique and transversalis muscles till the needle makes contact with the ilium. This should block the hypogastric branch of the ilio-hypogastric nerve and the ilio-inguinal nerves as they lie between these layers. Without withdrawing the needle from the skin its direction is now changed to lie parallel to Poupart's ligament, and some 20 c.cm. injected widely under the aponeurosis of the external oblique, and lastly the subcutaneous area reached through this puncture infiltrated. The needle is withdrawn and inserted through the now analgesic skin over the internal abdominal ring, and 20 c.cm. are injected under the aponeurosis through the internal oblique as it covers the inguinal canal and into the cord itself, infiltrating these structures thoroughly and blocking the genital branch of the genito-crural nerve. The subcutaneous area is injected last, as this enables the deeper infiltration to be more easily carried out. One more injection over the lower part of the inguinal canal

will reach the external abdominal ring, where the cord must be infiltrated as it crosses the pubis. On completion of the infiltration the patient should be allowed to lie quietly for some twenty to thirty minutes, while the solution is taking effect, before the operation is started.

Many operations, such as evulsion of the phrenic nerve in cases of active phthisis, colostomies or caecostomies in patients dangerously ill with obstruction, may be performed with advantage under a local anaesthesia, but space does not permit of giving details of each case.

OTHER CONDITIONS

In the third class mention may be made of blocking the lower intercostal nerves, as already described, with 2 per cent. novocain and adrenaline on one or both sides.

An extensive field blocking of the abdominal wall with 1/2 per cent. novocain and adrenaline may be combined with nerve blocking or employed alone. These measures should be carried out while the patient is under gas and oxygen, and when successfully performed contribute markedly towards obtaining muscular relaxation and so limiting the amount of ether or chloroform that has to be used.

Other uses of local anaesthesia include its employment in dental work and its recent application for injection of fractures, while cocaine or its substitutes are largely utilized for nose, throat, and eye operations.

The few examples of the application of local anaesthesia given in this article, while by no means exhaustive, may serve to show its value both to the whole-time anaesthetist and to the practitioner, and may encourage its employment by those who have as yet not been tempted to try it.

Local News

ENGLAND AND WALES

West Riding Medical Charitable Society

The one hundred and ninth annual meeting of this long-established Yorkshire charity was held at Harrogate under the chairmanship of Dr. Edgecombe. The objects of this society are to help medical men who have fallen on evil times and to give financial assistance to the dependants of members who die without having made provision for them. Of late years the society has interested itself to a greater extent than formerly in securing adequate education for the children of its members. In some twenty different centres of the West Riding one or two stewards are elected to report on the financial condition of the applicants for help, and in many cases they are able to give that personal information which is such a valuable supplement to mere documentary evidence. Any grants that are made are handed to the stewards, who are given discretionary powers in the dispensing of the money. Membership now numbers 1,261, and the financial condition of the society is very sound. The invested funds amount to £55,577, and the ordinary income is about £3,100, which represents the amount derived from investments and the one guinea annual subscriptions of members. At the annual meeting just held grants amounting to £2,713 were awarded, and a special grant of £50 was again made to Epsom College towards their fund for the provision of foundation scholarships for the sons of medical men. Dr. Wardrop Griffith, who has acted as honorary treasurer of the society for the last sixteen years, has resigned that position, and will be succeeded by Mr. Harold Collinson. At the end of the meeting the president, Dr. Edgecombe, asked Dr. Griffith to accept from the officers and stewards of the society an antique silver loving-cup as a token of their appreciation of his devoted service during his sixteen years' tenure of the office of treasurer.

Nutrition in Lancashire

The annual report for 1936 of the county medical officer of health and school medical officer to the Lancashire County Council Education Committee includes an interesting paper dealing with the nutrition of children at a council school. Some ten years ago a shop in the vicinity of this school greatly increased its turnover by providing fried chipped potatoes for children who were unable to go home for dinner. It then occurred to the head master to arrange for a well-cooked and varied midday meal at the school itself, and this scheme, by careful organization and by the delegation of the greater part of the housekeeping, marketing, and finance to the children, soon worked so smoothly that the head master found less than an hour a week to be adequate time for its supervision. The school in question serves a fair-sized village with a surrounding agricultural district. Medical surveys of 147 children, of whom rather less than a third were "school-fed," demonstrated that with the exception of one case these children were in better condition than the "home-fed." There were no badly nourished children in the "school-fed" group. The beneficial effect of the school midday dinner was most marked among the older children, who had in most cases been "school-fed" for two or three years. These striking results were obtained in a district where there is little poverty, and are attributed not to a calorific superiority but to a greater variety of diet in the school regime, for the home dinners were too frequently either stew or chipped potatoes. It is suggested that even more satisfactory results would be obtained by the application of this scheme in really poor districts.

Harlow Wood Orthopaedic Hospital

On July 28 Mr. R. H. Bernays, Parliamentary Secretary to the Ministry of Health, opened the new ward and extensions of the Harlow Wood Orthopaedic Hospital at Nottingham. These will provide twenty-one beds for male patients, rooms for about eight private patients, and additional accommodation for nurses. The total number of beds in the hospital is now approximately 155. Before the ceremony the eighth annual meeting of the hospital was held under the presidency of the Duke of Portland. The president of the hospital, the Duchess of Portland, in proposing the adoption of the annual report, said that the waiting list was larger than it had been at any time since the opening of the third ward three years ago. Mr. Bernays, in seconding the proposal, was impressed by the happy union of voluntary effort with support from employers, employees, and local authorities. He hoped that the progress made at Harlow Wood might be an incentive to the initiation of similar co-ordinated schemes in other areas. Mr. S. A. S. Malkin, supporting the adoption of the report, said that the Midland Colliery Owners' Mutual Indemnity Company had offered to give £5,000 as a contribution towards the provision of additional beds for the treatment of injured miners. This was an indication that what had been done in the past by the hospital had not only been beneficial to the men but had been a success from the financial point of view. Referring to co-operation between hospitals, he said that he hoped to see in the Nottingham area a grouping of hospitals with a joint contributory scheme, so that every patient could be admitted to the hospital best suited to deal with his or her case. Lieut.-Colonel G. A. Lewis, chairman of the Midland Colliery Owners' Mutual Indemnity Company,

handed to the president a cheque for £2,500, being the second instalment of the Company's gift of £5,000 for the provision of the new ward.

National Council of Social Service

The seventeenth annual report of the National Council of Social Service, 26, Bedford Square, London, W.C.1, has just been published under the title of *Voluntary Service* at the price of 1s. The report, which is well illustrated, gives among other things an account of the work it has done in promoting community centres in the new housing estates. It is now seven years since the National Council first took the initiative in forming a new estates community committee to consider the problem of social development in the new housing estates which surround the larger towns. It is pointed out that the evolution of the community life of the new housing estate cannot be effective without the participation of three agents: the local authority, the established voluntary bodies in the town, and the residents of the estate. It is reported that during the year no fewer than twelve local authorities have started schemes for community centres. Under the heading "The Challenge of Unemployment" the report refers to the need of the unemployed for organized help of the community, which may be given in many forms. The National Council is particularly concerned with that form which centres round the occupational club, of which there are now about 1,450 in England and Wales and Scotland. In these occupational clubs physical training has always had its place, and during the past year a special grant from the Ministry of Labour has enabled the National Council to develop it on a wider scale, a number of well-qualified instructors having been appointed.

Correspondence

The "Other Half" of Medicine

SIR,—The other day, at a psychiatric clinic where I work, I saw a patient suffering from a severe anxiety neurosis of nearly three years' duration. The documents attached to his case-sheet included a copy of a report from a distinguished physician on the staff of a well-known London teaching hospital, addressed to the patient's general practitioner, who had asked for advice. It ran as follows:

"I can find no evidence of organic heart disease in this case, and an electrocardiogram showed nothing beyond a simple tachycardia. Indeed, his symptoms could not possibly arise from the heart, and I agree with you that they are probably entirely of nervous origin. As you say, there may be some psychological factors at work which are the root of his trouble. I should favour reassuring him and continuing with the regular doses of bromide or luminal. Sometimes glucose taken between meals helps cases of this sort, and you might try it."

That type of logic surpasses belief. The case is a psychological one; therefore let us treat it by physical means! One did not have to be an orthodox Freudian to infer that the trouble might likely turn out to be psychosexual in origin on eliciting from the patient the information that he had his first anxiety attack on the day before his wedding (he had been "courting" for nine years). In the course of the interview it soon became clear that current and perfectly conscious and remediable sexual errors were responsible for the man's illness.

It is my belief that the advice which I gave to the patient and his wife will result in the spontaneous resolution of his symptoms within six months, without further psychotherapy. It is true that I spent an hour and a half on the case, and that it only takes a minute or two to prescribe bromide and luminal. But which is the better medicine?

In my introduction to my translation of Kretschmer's *Textbook of Medical Psychology* I said: "Medical psychology is not just a psychiatric 'sideline'—although it must provide the foundations for all sound psychiatric teaching—*but the 'other half' of medicine itself.*" That this truism is not appreciated by even the most distinguished exponents of the science and art of medicine in this country is a crying scandal. I should rejoice to be able to address the following letter to Dr. X:

"To-day I examined your patient, Mr. Smith. I agree with you that the patient is suffering from a (probably operable) cerebral tumour. I therefore recommend a course of psychoanalysis."

—I am, etc.,

London, W.1. E. B. STRAUSS.

Blood Alcohol and Drunkenness

SIR,—The question of the relation between the alcohol content of the blood and drunkenness has been much to the fore recently, and we have received a number of inquiries concerning the methods employed in determining blood alcohol. For some time past we have been investigating the extent to which figures for blood alcohol may be relied upon in assessing the extent of drunkenness, and, while this investigation is as yet incomplete, we feel that there are a number of points which it would be of value to bring to the notice of those interested in the subject.

First, there is the question of the method to be employed. There are two methods in common use: (1) Widmark's[1] micro-method, using one or two drops of blood; and (2) Southgate's[2] method, in which 2 to 5 millilitres (ml.) of blood are normally used. We ourselves use a modified Southgate apparatus and adapt the technique for either one drop or 2 to 5 millilitres of blood. It should be noted that the large-scale method is inherently more accurate than the micro-method. The Widmark method suffers from the drawback that the quantity of blood available is small. In all work of this nature both duplicate and control experiments must be performed, together with tests for interfering substances, such as acetone, so that the larger quantity of blood available for the Southgate method is preferable.

To illustrate the type of results obtained with our modified Southgate apparatus the following successive experimental determinations by both micro- and macro-technique are given. Alcohol content present in samples approximately 200 mg. per 100 ml.

Samples taken	Alcohol found
1. 0.1 ml. urine	202 mg. per 100 ml.
2. 0.1 ml. „	193 „ „
3. 0.135 g. blood	181 „ „
4. 0.146 g. „	176 „ „
5. 0.147 g. „	210 „ „
6. 0.152 g. „	186 „ „
7. 2.0 ml. „	187 „ „
8. 2.0 ml. „	187 „ „

Experiments 3 to 8 were performed on the same sample of blood.

[1] *Die theoretischen Grundlagen und die praktische Verwendbarkeit der gerichtlich-medizinischen Alkoholbestimmung*. 1932.
[2] *Biochem. J.*, **19**, 737. (See also Evans and Jones, *Analyst*, **54**, 135.)

Secondly, there is the question of material. Either blood or urine may be used, and it has been established that the ratio of alcohol in blood to that in urine varies narrowly about a mean figure of 1:1.35. In view of the common aversion of laymen to giving blood and the greater ease of collection of urine, especially in cases of drunkenness, we have found it very much simpler to work on urine. The quantity of urine available, moreover, makes it more easy to look for interfering substances.

Thirdly, it must be emphasized that it is the amount of alcohol absorbed into the blood which determines the extent of the intoxication rather than the absolute amount consumed. It has been established that part at least of the greater tolerance of the habitual drinker is due to his lower rate of absorption. Even taking this into account, it can be stated for any individual that a given blood alcohol concentration indicates a certain *minimum* alcohol consumption, and it is in this that lies the whole value of the test. The habitual drinker, of course, requires a larger consumption to produce a given concentration than does the occasional drinker.

Fourthly, there appears to be a feeling that certain cases will show strongly anomalous figures for alcohol concentration, and some people have an uneasy suspicion that they themselves might be regarded as under the influence of drink with a comparatively low alcohol consumption. We have not found this to be the case. It is generally accepted, and we have confirmed, that an alcohol concentration between 100 and 150 mg. per 100 ml. is the threshold concentration required to produce definite clinical symptoms of drunkenness. Our experiments all indicate that moderate consumption in an average person produces concentrations of the order of 45 to 80 mg. per 100 ml. in one and a half hours, which is well below the threshold. We have not attempted in our experiments, nor do we think it possible, to differentiate between anything more than the very broad stages of drunkenness, and in our opinion it is undesirable to classify intoxication any more precisely.

Moreover, persons charged with being under the influence of drink to a sufficient extent as to render them incapable of having proper control of a vehicle do not fall within the "doubtful" zone at all. In some typical police cases we found the following figures:

Blood alcohol	Percentage of cases
Below 100 mg. per 100 ml.	6
100—150 " "	11
150—200 " "	24
200—250 " "	47
Over 250 " "	12

Of these, those in the group under 100 mg. per 100 ml. were found "Not guilty," so that the fears of the innocent are unfounded in fact. Finally, we must emphasize that the blood-alcohol test does not penalize the guilty, except in so far as it renders the defence more difficult, but it is of enormous value to an innocent person. A person who has had a glass of beer and is charged on the strength of the odour of alcohol in his breath, or whose defect is due to disability or disease, has in the blood-alcohol concentration test a perfect answer to the charge.—We are, etc.,

J. DAVIDSON, M.B., Ch.B., F.R.C.P.Ed.
L. C. NICKOLLS, M.Sc., F.I.C.
Metropolitan Police Laboratory, Hendon, Aug. 19.

Treatment of Giant-cell Tumour of Bone

SIR,—If Dr. G. R. Osborn (*Journal*, August 14, p. 351) had been present at the discussion in Belfast he would have heard that there was general agreement upon three points:

1. That a tumour of bone could only be diagnosed with certainty by means of a biopsy.

2. That such a biopsy should consist of a free exploration of the tumour with pathological investigation carried out at leisure and not hurried in the operating theatre, for bone pathology is notoriously difficult, and there are few pathologists qualified to give an opinion in a difficult case.

3. That an osteoclastoma (benign giant-cell tumour) is capable of cure by the simple and safe surgical procedure of curetting.

The importance of these principles is emphasized by the case that Dr. Osborn quotes. This unfortunate man was subjected to *x*-ray treatment without any steps being taken to arrive at an accurate diagnosis. The tumour appeared to enlarge in spite of the treatment. An operation was then performed—a biopsy with immediate frozen sections from which a diagnosis could not be made, so the limb was amputated. Had he fallen into the hands of a surgeon who worked on the lines I have mentioned he would have had an early biopsy and a correct diagnosis, and his limb would have been saved by curetting.

I do not deny that radiation can arrest and cure an osteoclastoma, and there are cases in which inaccessibility or other reason may render this the treatment of choice. But why should the simple and safe surgical method which has been in use for forty years be abandoned for the much more dangerous method of radiation?

Those who advocate the use of radiation in the treatment of non-malignant tumours forget, perhaps, that they are using a method which must have an effect upon the other cellular elements besides those of the tumour. Skin, muscle, vessels, nerves, joint capsule, etc., must all be affected by the radiation, and the osteoclastoma requires, I believe, a heavy dosage. There is a real risk of interfering with function and, in a young person, with growth. A case which came under my observation at St. Bartholomew's Hospital some years ago emphasizes this point.

A young girl, a patient of a surgical colleague, had a tumour of the sacrum, which was diagnosed by biopsy as a benign giant-cell tumour. It was not considered practicable to open up thoroughly and curette, so radiation treatment was given and the growth arrested. But some years later she came to the orthopaedic department because of trouble first in one and later in the other hip-joint. It was then found that her sexual development had failed completely, no doubt because of the effect of the radiation treatment upon the pelvic organs; and she had a progressive slipping of the epiphysis of the head of the femur in each hip (adolescent coxa vara) with progressive arthritic changes such as are practically unknown in this deformity until much later in life. There is strong reason to believe that the development of the coxa vara and the subsequent degenerative changes in the hip-joints were also the result of the radiation treatment.

Dr. Osborn also suggested that the combination of radiation with biopsy is apt to render the tumour malignant. It is difficult to understand his reason for this. If a biopsy has not been done in the first place, there is nothing to prove that the tumour was not malignant from the start. Does Dr. Osborn suggest that merely cutting into an innocent tumour can render it malignant? If not, then the treatment by radiation is the only possible factor that can produce malignancy—surely another reason

against use of this method of treatment for an innocent tumour. I think that most surgeons will prefer to keep to the knife.—I am, etc.,

London, W.1, Aug. 19. R. C. ELMSLIE, M.S., F.R.C.S.

The Vocal Cords in Singers and Speakers

SIR,—One had hoped, in reading the report of the recent discussion on this subject, to have heard something, as Mr. R. R. Woods suggested, of the abnormalities of the larynx as seen by the stroboscope. Those who have witnessed the demonstrations of Stern in Vienna of this method—which is essentially suitable for the investigation of the larynx of the vocalist—will have been surprised to observe in a larynx apparently normal to ordinary indirect laryngoscopy one cord, for example, limping slowly along whilst the other moved normally.

It would be of interest to hear Sir Milsom Rees's experiences with the method in his unique field.—I am, etc.,

Manchester, Aug. 15. W. BRYCE MCKELVIE.

SIR,—All interested in the subject of singing and the care of voices of singers will welcome the further contribution by Sir Milsom Rees in your issue of August 7 (p. 292). The unique experience which Sir Milsom Rees has had through his long association with Covent Garden and the opportunities which he has had of observing the vocal habits of primitive tribes give him the right to speak with an authority which may be claimed by few others. Yet one feels that his statement that there is no such thing as a natural singing voice cannot be accepted unreservedly.

The larynx is primarily a sphincter mechanism guarding the lungs against the invasion of foreign material, and, secondly, it is a mechanism to maintain intrapulmonary pressure, fixing the thorax and helping to stabilize the pectoral girdle during violent movements of the upper extremity. The use of the laryngeal mechanism for the production of purposive sound is a much later adaptation, and has subsequently given rise to both speaking and singing. Anyone who is interested in this subject should read that excellent work by Negus, *The Mechanism of the Larynx*. The act of speaking or singing involves a highly specialized nervous and intellectual mechanism, and one cannot ignore the place which the intellect holds in both these arts. A child learns to speak by hearing the speech of others around it, and it is my belief that people learn to sing for the same reason. The sound pattern in singing is more difficult to imitate than the sound pattern in speech, as singing depends upon the appreciation and imitation of both pitch and tone. That there is a marked difference between the singing of primitive tribes and of cultured races does not cause a great deal of surprise, because the standard of development and the size of vocabulary of the primitive tribe is poor in comparison with the power of speech and the vocabulary of the cultured races. I believe that it is a fact that some of the pigmy races have such a limited vocabulary that they cannot communicate in the dark, as they are then unable to supplement their lack of articulate speech by a language of signs.

If there should be this difference in such an important and necessary function as speech between the savage and the cultured races it is not remarkable that a luxury art, such as singing, should remain undeveloped in primitive people. The increase in the range and quality of the singing voice in the civilized races must, I think, be due to the wider range of instrumental music, which serves as a pattern for the voice to imitate. Sir Milsom Rees points out that the savage tribes sing to the accompaniment of the tom-tom. I wonder whether this is the only sound pattern which the natives have to copy? I suppose that one can take it for granted that the actual anatomical mechanism is present in the less civilized races just as it is presumably present in the higher apes, and the essence of the problem is whether there is a faculty lying dormant which can readily develop under the influence of a suitable musical environment.

I am prepared to agree that nobody sings instinctively; but nobody speaks instinctively. It would be very unusual for anybody to attain the highest level of artistic attainment in any branch of the arts without some training, and I think the difference between training which is directed towards the acquirement of a specialized technique in any art should be clearly differentiated from the training which is primarily directed to the development of a natural aptitude for that art. It is the natural aptitude, which in singing is probably nothing more than a highly developed gift of mimicry, which makes a natural singer.

Granted that the vocal mechanism is a universal endowment, the most important difference between singers and non-singers lies in the brain and not in the larynx. One must agree with Sir Milsom Rees that probably the best singers are yet to be heard, but it seems to me that progress in this direction must inevitably be slow unless the essential problems of voice production are tackled by the combined efforts of the laryngologist and the teacher of singing—a point which I stressed in my paper at the Annual Meeting in Belfast. It surprises me not that vocal disabilities exist so frequently in professional singers and speakers, but rather that the vocal mechanism survives so well, in view of the many different methods of teaching which exist and the rather chaotic state of the subject at the moment. I wonder, too, how such apparently frail structures as the vocal cords survive the exacting demands made upon them in some of the heavier operatic works.—I am, etc.,

Manchester, Aug. 16. VICTOR LAMBERT.

Anaesthesia in General Practice

SIR,—Dr. H. Garner-Evans (*Journal*, August 14, p. 355) is to be congratulated on his happy experiences with pernocton, but it must be remembered, as indeed he himself suggests, that the defects of an anaesthetic may not be revealed until a really large number of trials have been made. Large numbers of administrations of pernocton have been carried out, chiefly on the Continent, and the record of them proves that although there is no question of its efficiency there is considerable doubt as to its safety when compared with the other commonly used barbiturates.—I am, etc.,

London, W.1, Aug. 18. J. BLOMFIELD.

Elongation and Dilatation of the Colon

SIR,—I have read the report of Professor J. R. Learmonth's "last word" on elongation and dilatation of the colon with great interest (*Journal*, July 24, p. 154). With due respect to his position in my alma mater at Aberdeen, I venture to point out that elongation and dilatation are usually only part of a late picture, found so frequently in patients who suffer from disabilities which, judging from the results of treatment, must be ascribed to faulty colonic function. This faultiness is most usually due to developmental abnormalities affecting the colon mechanically, and apparently producing elongation as well as dilata-

tion, which tend to disappear when the mechanical disabilities are adequately treated. In a few of my cases I have had opportunity to establish the fact of such reduction by direct inspection.

The degree of certainty with which one can relieve distressing symptoms (both intra- and extra-abdominal) in cases of colonic insufficiency which is not due to ordinary organic disease, and which react unsatisfactorily to medical therapy, is astonishing. It convinces me that these very common developmental abnormalities are the most important factors in the production of such symptoms. In particular, the evacuation of the colon attained is usually so satisfactory that patients speak of the act with enthusiasm!

I am fully aware of the hostile attitude towards surgical treatment of these conditions prevalent in the British Isles and elsewhere. Sir William Arbuthnot Lane, by advocating treatment which in many cases could only be described as disastrous, "queered the pitch" which he had so carefully prepared. The inadequate measures put forward by others, planned to relieve only parts of the trouble, met with the discouraging degree of failure which one would nowadays expect. In spite of all that the results of the treatment which I advocate (gradually evolved over a period of twenty-five to thirty years) make me wish that some other surgeons would fairly put it to the test. There is indeed ample material available. For that reason I have described the operation very fully in my book *The Colon as a Health Regulator* (Macmillan Company of Canada, Toronto—represented by Macmillan and Co., Ltd., London), which was reviewed in the *Journal* of June 19 (p. 1259).

My book is concerned chiefly with the recording of actual facts. The facts in relation to the results of treatment are so encouraging, and in some cases so surprising, that I am hopeful that those who are interested in the subject will read my book before they accept Professor Learmonth's dogmatic condemnation of surgical intervention when faulty colonic function has to be treated. I am convinced as to the efficacy of proper surgical treatment in these colonic cases. The propriety of the treatment is evidenced by the relief which it affords in the matter of local symptoms (both subjective and objective) and in giving a feeling of general well-being previously absent. One can speak, just as Professor Learmonth does, of "dramatic immediate improvement in function," and very few patients fail to maintain that improvement.

Armchair criticism is to be deprecated in the discussion of this matter, as it is in other practical problems. The fact is that very few can speak with justifiable conviction about the full surgical treatment I recommend because they have not tried it! Most of my patients have undergone careful and prolonged medical treatment by various doctors without relief. A recent very miserable one brought to me a dossier of prescriptions, diet sheets, regulations for daily life, etc., more than an inch thick. He had consulted twenty-two doctors, and had been to a special clinic in Paris—without any benefit. Yet within ten days of operation his outlook on life had become completely changed and has remained so. His remarks are exuberant with regard to his general health and the action of his colon! A similarly affected patient, operated on seven years ago, has been seen unexpectedly, owing to an injury, since I decided to write this letter. His enthusiasm concerning my treatment of his abnormal colonic conditions has not lessened, so that the effect of the operation need not be ephemeral, as some destructive critics would have it!—I am, etc.,

Montreal, Aug. 11. HENRY M. W. GRAY.

SIR,—In a note on *The Colon as a Health Regulator* by Sir Henry M. W. Gray (*Journal*, June 19, p. 1259), it is said that one statistical statement "does not accord" with another statistical statement. The first statement refers to the number of deaths—namely, four—in the series of 205 operations, while the second refers to the number of cases in which complete failure has to be recorded—namely, 1 per cent. in the series. As these figures deal with two entirely different computations the question of "accord" does not arise: on the other hand, there is no contrariety between them. The last sentence, "Other claims unsupported by figures may be even wider of the mark," can have no bearing whatever, as your reviewer up to this point has failed to prove anything wide of the mark.

The impression is inescapable that your reviewer indulges in fault-finding in questioning the data of the book, with the evident intention of disparaging this work, but those who know the character and reputation of the author will give no credence to such misleading statements. The really unfortunate result of such "notes," appearing as they do in a publication of the high standing of the *British Medical Journal*, is that they may turn medical men away from a study of the book and thereby, I am convinced, deprive many patients of the often very great and permanent relief that only the treatment outlined in this book can afford. Having had the opportunity of examining numerous patients submitted to the author's operation, I can assure your readers that Sir Henry is distinctly conservative as to the beneficial results attained. —I am, etc.,

W. M. MACNAB, M.B.

Victoria, British Columbia, Aug. 1.

SIR,—In reply to Mr. E. G. Slesinger's letter (*Journal*, August 14, p. 352), we must express our regret at having inadvertently misrepresented his views on the surgical problems of the elongated pelvic colon. In extenuation we can only say that we were misled by the very words which he quotes from his original paper: "The following remarks are therefore not intended to suggest that elongation of the pelvic colon necessarily results in the production of symptoms, but rather to point out that in certain cases such elongation produces results sufficiently severe to call for relief. . . ."

These remarks seemed to us to indicate that Mr. Slesinger believed that certain cases of uncomplicated dolichosigmoid were capable of producing symptoms requiring surgical treatment. While we are in complete agreement with many of Mr. Slesinger's published views, there is, nevertheless, a considerable divergence in our respective attitudes to some aspects of the subject; the chief difference is that we do not believe that dolichosigmoid in the absence of certain complicating factors can ever require surgical intervention.

Our opinion still coincides with that of Mr. Garnett Wright (*Journal*, April 28, 1928, p. 712), that the production of bands on the outer surface of the mesentery is due to plastic peritonitis set up by repeated attacks of partial strangulation, and not to a natural reaction of the body to the strain of an overloaded sigmoid colon. The cases referred to by Mr. Slesinger in his letter to the *Journal* of July 15, 1933 (p. 129), in which a peculiar type of constipation was produced by a prolapse of the loaded pelvic colon and consequent abnormal angulation at the pelvirectal junction, do not appear to us to require surgical intervention. Our own standpoint is that radical surgical measures should be reserved for patients in whom the clinical and radiological features present a characteristic

syndrome, as summarized by us in our letter to the *Journal* of August 7 (p. 293), and that such cases are by no means rare.—We are, etc.,

D. LIGAT.
T. D. OVEREND.

St. Leonards-on-Sea, Aug. 18.

Insects and Disease

SIR,—I have read with interest Major-General W. P. McArthur's lecture (*Supplement*, August 14, p. 126), in which he states that the fever which afflicted Cromwell's troops in Ireland was typhus fever. I give you the true facts, leaving your readers to judge whether the disease was typhus fever or imported plague. On January 30, 1649, King Charles I was executed. In July of that year an English ship arrived in Galway with uniforms and supplies for the few hundred Royalist soldiers of Ormond's army quartered there. This vessel was said to carry in those supplies "the contagious infection of the plague in its first appearance in Ireland. . . . Plague broke out immediately." The *Annals of Galway City* (Historical Manuscript Commission, Tenth Report, Appendix, Part V, p. 500, London, Eyre and Spottiswoode, 1885) gives the following:

"That this Toune of Galway, the last year being the mayoralty tyme of Sir Walter Blake, Knight, was visited with the contagious infection of the Plague which continued from July one thousand six hundred and fortie nine till spring after."

"That all members of the toune have met in the country and have consented to a tax of two thousand marckes sterling towardes the charges of physitians and providing of all other necessaries requisit for the purifing and clensing of the said toune which was with all earnestness pursued by these intrusted with that charge."

The city once freed from infection, the inhabitants returned; Galway had lost 3,900, Dublin 30,000, from the plague. But despite all these sanitary methods, Galway City experienced later a second visitation. Colonel Lawrence, an officer of Cromwell's army, in his *Interest of Ireland* (Part II, pp. 86–7) writes:

"Plague and famine had so swept away whole counties, that a man might travel twenty or thirty miles and not see a living creature, man, beast, or bird; our soldiers would tell stories of the place where they saw a smoker, it was so rare to see either smoke by day or fire or candle by night."

Lawrence estimated that five-sixths of the Irish population had perished, an estimate adopted by Prendergast in his *Cromwellian Settlement of Ireland* (1863). The plague ran its course until 1653. Twelve years later, in 1665, it raged in London. General Ireton died of plague in Ireland. One would not expect that he would suffer from louse infection (typhus), and beasts and birds do not die of typhus fever or of "Buchan's malaria." Yet Galway City for nine months successfully resisted the Cromwellian siege, a proof of its powers of resistance, even with the loss of its best fighting men in two visitations of the plague.—I am, etc.,

Athenry, Co. Galway, Aug. 16. C. H. FOLEY.

Injection of Umbilical Vein in Retained Placenta

SIR,—Mr. David Currie, in his paper in the *Journal* of July 10 (p. 58), once more emphasizes the dangers of manual removal of the placenta—45.2 per cent. morbidity and 15.4 per cent. mortality are indeed staggering figures. Since the publication of his first paper (1932), in which he pleaded for a more extended use of cord injection, I have been employing this method with certain modifications for the treatment of retained placenta. Starting at St. Mary's Hospital, London, in that year, I have continued to use this form of treatment in the obstetric unit of Hong Kong University.

The technique is even simpler than that advocated by Mr. Currie, and has been reported elsewhere (1936). All that is required is a 200 c.cm. metal ear syringe. This is filled with warm sterile saline or water. The cord is re-cut and the nozzle of the syringe is pushed into the umbilical vein. One can tell if the nozzle is inserted in the vein, for when it is in this vessel it can be easily pushed down the cord. The nozzle being held firmly in the cord with the left hand, the contents of the syringe are rapidly injected. An assistant refills the syringe and a further 200 c.cm. are quickly introduced. Following this, Credé's manœuvre is attempted. In one case 800 c.cm. were injected without any deleterious effect before the placenta was expressed. One of the causes of failure of this treatment is the presence of a contraction ring.

The method as outlined above is so simple that even a midwife can undertake it. There are occasions when medical aid is not at hand and a midwife has to deal promptly with a major emergency. Rather than wait till the doctor's arrival and severe exsanguination of the patient, the midwife could at least try cord injection before putting her hand in the uterus to remove a retained placenta. In the Tropics manual removal of the placenta is even more hazardous than in England, for many of the patients who come to hospitals for their deliveries are suffering from a marked degree of secondary anaemia, malnutrition, infections, etc.

Lack of conservatism in obstetric practice is now recognized as a contributory factor in the high maternal mortality which is found in certain countries. Mr. Currie is to be commended for reviving a conservative method of treatment which has been allowed to remain in desuetude for a century.—I am, etc.,

Hong Kong, Aug. 6. W. C. W. NIXON.

Currie, D. W. (1932). *Lancet*, **1**, 1087.
Nixon, W. C. W. (1936). *Chinese med. J.*, **50**, 1832.

Tennis Elbow

SIR,—In the past the term tennis elbow was used in rather a vague sense, and many authorities included under it a heterogeneous collection of disabilities in the region of the elbow-joint and forearm. In order that the results of treatment may be of more comparative value it is necessary to have a standard definition of the term. Tennis elbow must, in virtue of its name, stand for the commonest cause of disability in the elbow of a tennis player.

According to Mr. G. P. Mills (*Journal*, July 31, p. 212) the commonest condition in his series of fifty-eight cases was one characterized by radio-humeral tenderness, presumed to be due to the nipping of the frayed edge of the coronary ligament. He does not mention what proportion of the cases were tennis players, however. In my own experience another condition is responsible for the majority of cases of tennis elbow, and is best designated as traumatic periostitis at the origin of the extensor carpi radialis brevis muscle. Both conditions may occur, and often do occur, in people other than tennis players. Mr. Cyriax, in the *Journal of Bone and Joint Surgery* (October, 1936) points out no fewer than twenty-six pathological conditions that have been described as responsible by various authors, all of which goes to show that tennis elbow is an incredibly bad term. Nevertheless, in order

to establish that traumatic periostitis of the extensor carpi radialis brevis is the responsible condition, may I give a brief description of its principal features.

1. It is in my experience the commonest of the disabilities occurring in the elbow of a tennis player.

2. It is brought on by the excessive use of the extensor carpi radialis brevis muscle, as in the fixation of the wrist in slight dorsiflexion to obtain the maximum grip on the racket.

3. It is localized to the site of origin of the muscle.

4. The pathology as shown by operative exploration is best described in stages. First, there is a tear at the site of origin of the tendon from the periosteum, with extravasation of fluid forming a localized oedema; the effusion of blood is slight owing to the relative avascularity of the tendon; secondly, the oedema or clot is organized, and forms a fibrous tissue adhesion. If the condition is extensive it may give rise to such a marked periosteal reaction that it will show in an *x*-ray film.

The localization of the site of the disability is dependent on the following factors:

(*a*) The pain occurs on increasing the tension in the extensor carpi radialis brevis muscle—for example, by active contractions as in lifting or gripping with the forearm pronated, or by passive stretching as in flexion of the wrist with the elbow extended. Mr. Cyriax points out a useful test: "Active extension of the wrist by a patient with tennis elbow causes him more pain when it is resisted by pressure on the heads of the metacarpals than when the pressure is applied on the tips of the extended fingers."

(*b*) The pain occurs at the site of origin of the extensor carpi radialis brevis muscle, and may in some cases be accompanied by pain in the line of the muscle itself.

(*c*) Tenderness is maximal at the origin of the extensor carpi radialis brevis muscle—that is, just *above* the capitellum on the anterior aspect of the humerus, and not strictly localized to the radio-humeral joint line or the epicondyle itself.

The results of treatment indirectly confirm the pathology, and treatment itself naturally depends on the pathological stage of the condition. In the acute stage rest from tennis is the main line to be adopted; occasionally manipulation dispersing the localized oedema will relieve the tension and so abolish the pain. In the second stage, the stage of adhesions, manipulation may rupture these tender structures and effect a cure. Lastly, open operation, whereby the periosteum is elevated from the bone in the affected region, can undoubtedly be successful in a still larger proportion of cases.

It is for reasons contained in the above description that I think the term traumatic periostitis should be accepted as synonymous with tennis elbow, and other cases, such as nipping of the frayed edge of a coronary ligament, ligamentous strain, bursa formation, arthritis of the elbow-joint, generalized fibrositis, or any of the other twenty-six pathologies which have been suggested, should be diagnosed under their appropriate headings.—I am, etc.,

Norwich, Aug. 10. G. K. MCKEE.

Malaria Control

SIR,—In the *Journal* of June 5 (p. 1175) there appeared a letter by Dr. W. M. McDonald on the use of quinine. If the figures given are correct, then each person would have had, on an average, a dose of 140 grains. At a daily dose of 5 grains that would be sufficient for thirty days and no more. But some of that quinine was used for curative purposes in large doses, so that the average of 5-grain prophylactic doses must have been taken for less than thirty days. It is obvious then that the quinine was not used properly as a prophylactic; the population could not possibly have had the daily dose of 5 grains over the necessary period of months.

This problem of quinine is very old, and also tiresome. From an extensive experience in such areas I am convinced that quinine is a most valuable prophylactic; and one wonders why there is so much doubt about. The figures given in this letter afford a perfect explanation. They seem to me to be a terrible admission of the failure of the *measures*, but scarcely concern the method, as the method was not followed. That is exactly what one finds in these malarial areas; where the people take their daily dose regularly and at the proper time they do not get malaria, or very seldom. It is the people who pretend to take it regularly but who certainly do not do so who go down; then they take very large doses and become seriously ill.

I suggest that Dr. McDonald's letter shows conclusively that it is the administration which is at fault and not the method. I consider that the agitation against the use of quinine as a prophylactic does a vast amount of harm. No one will decry the other measures, such as drainage, etc., but it is not often easy to apply them; whereas the quinine can be used everywhere and by everyone, with few exceptions.—I am, etc.,

Surrey, Aug. 15. W. F. COOPER.

P.S.—Actually, I am about to leave for a district where everyone is troubled with mosquitos, where malaria is quite bad. I do not even have nets. But then everything is drained, and if one fly or mosquito is found the boys have to turn out and hunt the source. So that it may be seen that I adopt every other means, as well as quinine, to live in comfort and health. It is when one goes about that one requires and finds the benefit of quinine.

Squint and Heterophoria

SIR,—In the discussion on squint and heterophoria in the Section of Ophthalmology at the Annual Meeting I was reported to have pointed out "the dangers involved in too radical operative disturbance of the extra-ocular muscles" (*Journal*, August 7, p. 285). It was what I think is a mechanically incorrect, and not a radical correction, to which I object. I consider that in squint the place of insertion of the muscles into the eyeball is not at fault; that advancement or recession operations cannot result in harmonious action of the recti and oblique muscles; and that the right operative procedure to correct the deformity is to lengthen a muscle that is too short by longitudinally splitting it into three strands and tenotomizing the two outer strands (lower and upper), and to shorten a muscle that is too long by dividing the tendon the necessary distance back from the eyeball and suturing tendon to tendon.—I am, etc.,

Londonderry, Aug. 19. J. W. KILLEN.

Spa Treatment in Hot Weather

SIR,—Professor A. J. Clark's paper on individual variation in response to drugs (*Journal*, August 14, p. 307) has inspired the following notes.

Dealing with spa waters as an external application the ratio of dose to body weight is negligible, but amongst other factors affecting response is the state of the weather at the time of treatment. I had a good opportunity of observing the reactions of twenty-one patients during the period of hot weather from July 30 to August 14. The cases included eight of osteo-arthritis, five of gout, four of muscular rheumatism and fibrositis, two of fibrositis and neuritis, and two of colitis.

All the gouty cases did well, and all but one were able to stand full treatment, most of them having immersion baths and

vapour baths on alternate days. Three of the osteo-arthritic group had to have their treatment times and the temperature of the water and packs reduced considerably, and even then complained of feeling unduly tired, with an increase of pain in the joints. They were all of similar age and condition. The remaining five cases of osteo-arthritis stated that they liked the hot weather. The muscular rheumatism group also stood the treatment well, but two cases of sciatica (fibrositic type) were quite content to be immersed in water at 98° F., and have treatment on alternate days only. The weather made no difference to the cases of colitis.

The blood pressure and pulse rate were taken before and after treatment, and were found, as usual, to come down where high and go up a little where low. The general feeling of well-being, with increased appetite, was apparent in all except the three osteo-arthritics, who still felt fatigued on reduced treatment. Though the cases are taken haphazard as they came to me, there was no obvious reason for this—for example, dental or other sepsis or other disease—in these three patients. One of them comes regularly in the colder months for osteo-arthritis of both hips, and can then stand full treatment with benefit.

The following two cases of osteo-arthritis and two cases of gout show in the first case of each condition normal reaction to normal treatment, and in the second cases the modifications necessary on account of the warm weather.

Case 1.—Age 64: osteo-arthritis knees, lower lumbar vertebrae, and fingers (Heberden's nodes); blood pressure, 180/100; pulse 76, regular. Treated by mineral water, 20 oz. daily; deep bath at 102° F. with undercurrent douche to back and knees at 110° F. for last half of bath; fifteen-minute bath followed by full pack to waist line for fifteen minutes. Three baths a week on alternate days. Mud packs to back and knees for fifteen minutes; short needle douche at 101° F., followed by thirty minutes' massage to thigh muscles and back. Three treatments a week. After a week's treatment the patient was walking better, with more movement of the lower spine and no pain; blood pressure 160/97; standing treatment well.

Case 2.—Age 68: osteo-arthritis hips and sacro-iliac joints, and slightly in the dorso-lumbar region; blood pressure, 170/100; pulse 66. Treatment was as above. After second treatment complained of feeling sick and tired; gave day's rest, and prescribed electric reclining bath at 100° F. for fifteen minutes, with sponging of forehead during bath and pack, which was only used for hips; three baths a week. No complaint of sickness or undue fatigue, and patient was able to finish course, with general improvement in walking and less stiffness on getting out of chair after sitting.

Case 3.—Age 70: gout; blood pressure, 190/105; pulse 78, regular. Chronic tophi in feet and wrists. Treated by deep-flowing water baths at 102° F. for fifteen minutes, followed by light pack, cold towels to chest, neck, and forehead for fifteen minutes; three treatments a week on alternate days. Vapour baths in cabinet to 110° F. for fifteen minutes. Cold sponging to forehead during bath, and small Leiter's coil to precordium with ordinary tap-water running through, followed by needle douche for three minutes, cooled down to 98° F.; light pack; three a week. After three treatments the blood pressure fell to 170/100, and after ten to 160/100; pulse 70. This patient had our normal treatment and did well.

Case 4.—Age 63: gout; blood pressure, 160/95. Recent acute attack of gout in great toes; first on the right side and then, while still on colchicum, potassium iodide, and much-restricted diet, attacked the left great toe as well. The acuteness had disappeared, but there was still some tenderness remaining ten days after all swelling had disappeared. Deep bath prescribed as above. Patient felt very tired after the bath, and disinclined to get up for dinner that evening. On seeing him the next morning he still complained of feeling tired. Prescribed a day's rest and a vapour bath next day, which I superintended at 11 a.m. Blood pressure before treatment was 150/90; pulse 60, regular, and of fair volume. Vapour bath (cabinet), temperature gradually increased to 110° F. in five minutes, kept at this for seven minutes; cold sponging forehead, and Leiter's coil to chest; two minutes' needle douche cooled down to 95° F.; no pack. Rested under cool sheet for fifteen minutes. Directly after bath blood pressure was 150/90; pulse 56. Had an hour in bed and got up for lunch, and went for a drive in the afternoon. Next morning he said he felt well; continued this mild vapour bath daily, except Sundays, for nine days. All tenderness had disappeared, was walking well and feeling better in every way.

The number of cases observed were too few to generalize on, but the personal factor was well brought out. I rather think that the patients who could stand full treatment in hot weather got quicker benefit than they would have done in cold weather.—I am, etc.,

Bath, Aug. 18. A. GORDON WATSON.

Insulin Hypoglycaemia

SIR,—In view of the letter from Dr. H. S. Pemberton in your issue of July 24, may I be allowed to draw attention to an abstract in the Epitome (*Journal*, June 19, No. 490, p. 98) of a paper by R. Freudenberg. His subject is the administration of insulin shock therapy for schizophrenia. He

"draws attention to the parallel between vitamin B_1 deficiency and insulin shock. Experimentally it has been shown that in both conditions there is a lessened intake of oxygen in the grey matter of the brain. . . . Freudenberg has found that the administration of vitamins B_1 and B_2 and adrenal cortex hormone has succeeded in interrupting coma in non-reversible cases of insulin shock. . . . The author claims that the administration of vitamins B_1 and B_2 is a valuable therapeutic agent in making insulin shock therapy safe."

No information is given as to whether the obvious extension of this experiment to diabetes has been tried, but it seems that vitamin B might possibly prove of use in such cases as those mentioned by Dr. Pemberton, and even more so in cases treated by protamine zinc insulin, where delayed overaction of the insulin is so hard to counteract.—I am, etc.,

Bathford, Aug. 9. A. G.

Universities and Colleges

UNIVERSITY OF CAMBRIDGE

John Hart-Mercer, M.B., Ch.B.Ed. has been elected to the Gwynaeth Pretty Studentship for three years from October 1, and he has been awarded the Nita King Scholarship for the same period.

At a congregation held on July 30 the following medical degrees were conferred:

M.D.—*J. D. Procter, W. B. A. Lewis.

M.B., B.CHIR.—*E. M. Evans, *P. Kidd, *C. R. Morison, *G. O. Richardson, *G. M. Fleming, *C. D. Anderson, *H. A. Brook, *T. P. H. McKelvey, *E. F. Aubert, *I. A. Guest, *P. F. Barwood, *J. O. Collin, *W. H. Ekin, *M. T. Parker, *E. A. Pask, J. F. H. Bulman, R. C. B. Barbor, F. S. Cosh, E. B. French, H. Haigh, J. P. Reidy, W. B. Waterfall, R. C. S. Dick, C. J. S. Sergel, R. W. Watts, J. P. Singer, C. T. A. Burgess, J. N. Fell, J. C. Gilson, E. A. G. Goldie, C. E. D. H. Goodhart, J. N. Horne, R. W. Markham, J. H. Moir, A. K. Pardhy, K. M. M. Sheldon, H. R. Wynne, I. G. Braddon, A. C. Cunliffe, W. G. Murray-Browne, R. C. Neville, M. Feiwel, C. M. Dickins, T. P. Myles, C. G. Scorer, P. H. Willcox, R. F. Ashwin, R. Edwards, N. F. Coghill.

* By proxy.

During the month of July the titles of the degrees of M.B., B.Chir. were conferred on M. B. Billington and G. M. S. Caldwell of Newnham College, and that of M.B. on E. M. Wright of Girton College.

POSTGRADUATE COURSES FOR INSURANCE PRACTITIONERS*

The following are particulars of postgraduate courses for insurance practitioners at the British Postgraduate Medical School, Hammersmith, London. These courses have been arranged jointly by the Insurance Acts Committee and the Ministry of Health. Those practitioners wishing to participate should apply at once to the secretary of their local panel committee for a form of application.

SEPTEMBER COURSE

This course will begin on Monday, September 20, and end on Saturday, October 2. The subjects are as follows: principles of the examination of patients; pain in the foot; common types of anaemia, diagnosis and treatment; ante-natal examination; common skin diseases; pneumonia; nephritis; enlarged prostate and cystitis; common diseases of ear, nose, and throat; diagnosis of nervous diseases; eye conditions in general practice; allergic diseases; chronic rheumatism; children's diseases in general practice; abdominal pain; infectious diseases; demonstration of local anaesthesia; surgery of the chest; migraine and headache; toxaemias of pregnancy; psychiatry in general practice.

The lecturers include: Professor Thomas Beattie, Mr. Robert Milne, Dr. Janet M. Vaughan, Professor James Young, Dr. R. T. Brain, Dr. J. L. Livingstone, Dr. Horace Evans, Mr. Terence Millin, Dr. George Bray, Dr. Charles W. Buckley, Mr. V. Zachary Cope, Dr. J. S. Anderson, Mr. John Hunter, Dr. Macdonald Critchley, Professor F. J. Browne, and Dr. Henry Yellowlees.

OCTOBER COURSE

This course will begin on Monday, October 18, and end on Saturday, October 30. The subjects are as follows: principles of the examination of patients; ante-natal examination; rheumatoid arthritis; possibilities and limitations of radiotherapy; demonstration of local anaesthesia; common types of anaemia, diagnosis and treatment; convulsions and similar conditions; frequency of micturition; diagnosis of nervous diseases; common diseases of throat, nose and ear; psychology in general practice; common skin diseases; obstetric injuries, immediate and remote effects; acute pyogenic infections, including those of the hand; pulmonary tuberculosis; children's diseases in general practice; toxaemias of pregnancy; dyspepsia; cholecystitis; the acute abdomen; eye conditions in general practice.

The lecturers include: Professor F. R. Fraser, Professor James Young, Mr. G. F. Stebbing, Dr. Janet Vaughan, Dr. Macdonald Critchley, Mr. V. W. Dix, Dr. J. R. Rees, Dr. R. T. Brain, Mr. V. B. Green-Armytage, Mr. Charles Donald, Dr. R. C. Winfield, Professor F. J. Browne, Sir Arthur F. Hurst, Dr. Charles Miller, and Mr. H. C. Edwards.

NOVEMBER COURSE

This course will begin on Monday, November 15, and end on Saturday, November 27. The subjects are as follows: principles of the examination of patients; physiotherapy; dyspepsia; pyuria; asthma; common types of anaemia, diagnosis and treatment; injuries and infections of the hand and wrist; endocrine disturbances in gynaecology; diagnosis of nervous diseases; common diseases of throat, nose, and ear; convulsions and fits; heart failure; haemorrhoids and varicose veins; difficult labour; streptococcal infections and recent therapy; common skin diseases; infectious diseases; acute abdominal emergencies; common respiratory diseases; children's diseases in general practice; eye conditions in general practice.

The lecturers include: Professor G. Grey Turner, Dr. A. E. Clark-Kennedy, Mr. J. Swift Joly, Dr. G. W. Bray, Dr. Janet Vaughan, Mr. J. P. Hosford, Dr. P. M. F. Bishop, Dr. J. Purdon Martin, Dr. Paul Wood, Mr. C. Naunton Morgan, Mr. Leslie Williams, Dr. Leonard Colebrook, Dr. R. T. Brain, Dr. W. Gunn, Mr. Philip Turner, and Dr. W. E. Lloyd.

* Details of grants payable by the Ministry of Health to insurance practitioners who wish to take these postgraduate courses will be found in this week's *Supplement* at page 153.

Medical News

The annual dinner of Westminster Hospital Old Students will be held at the Park Lane Hotel, London, on Saturday, October 2, with Mr. A. F. MacCallan in the chair. The inaugural address of the school will be given at the Caxton Hall, London, on Monday, October 4, at 3 p.m., by Sir Seymour Hicks.

An anonymous donor has offered the Royal Northern Hospital, Holloway, London, a gift of £40,000 provided that a similar amount is contributed by others interested in the work of London's seventh largest general hospital. This munificent gift is made in connexion with the special appeal for £350,000 for the reopening of wards and for the renovation and rebuilding of certain parts of the hospital.

The ninth annual conference of the National Smoke Abatement Society will be held at the Philosphical Hall, Leeds, on Thursday, Friday, and Saturday, September 30, October 1 and 2. The programme includes discussions on town planning and smoke abatement and education and smoke abatement, and papers will be read by representatives of the regional committees. Full particulars can be obtained from the secretary of the society, Chandos House, 64, Buckingham Gate, Westminster, S.W.1.

The fifth session of the Australasian Medical Congress was opened by Sir George Murray, the Lieutenant-Governor, at Adelaide on August 23. Four hundred and fifty medical delegates from all parts of Australia and New Zealand are attending the Congress. Oversea representatives include Professor Grey Turner from England and Dr. C. E. G. Beveridge from the Sudan. The congress is meeting for six days under the presidency of Sir Henry Newland. On the afternoon of August 23 the Chief Secretary, Sir George Ritchie, laid the foundation stone of the Institute of Medical Research, to which Dr. E. W. Hurst has been appointed director.

The tenth Congress of French-speaking Gynaecologists and Obstetricians will be held in Paris from September 30 to October 2, under the presidency of Professor Mocquot.

We learn from the *Pharmaceutical Journal* that new regulations imposed by the National Health Administration of China prohibit in all advertisements, circulars, labels, or wrappers of patent medicines any wording or meaning suggestive of the futility of professional medical treatment, or any contemptuous or detrimental remark about the medical profession.

Dr. H. M. O. Lester, Deputy Director of Sleeping Sickness Service, Nigeria, has been awarded a Carnegie grant for visits to the Congo, Tanganyika, the Southern Sudan, and other parts of Africa to study methods of sleeping-sickness control.

The King has granted Dr. Robert Scott Taylor authority to wear the Insignia of the Third Class of the Brilliant Star of Zanzibar conferred upon him by the Sultan of Zanzibar in recognition of valuable services rendered by him.

Dr. Jean Charcot, drowned when the *Pourquoi Pas?* foundered off the coast of Iceland, has been succeeded by Dr. Louis Martin, director of the Pasteur Institute, as a member of the French Academy of Sciences. Dr. Charcot is succeeded in the French Academy of Medicine by the author Dr. George Duhamel.

The Egyptian Medical Institute of Cairo, which is the oldest and largest European institute in Egypt, has elected as its president Professor Mochi, director of the Italian Hospital and head of the Royal Society of Medicine at Cairo.

Letters, Notes, and Answers

All communications in regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, W.C.1.

ORIGINAL ARTICLES and LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone, unless the contrary be stated. Correspondents who wish notice to be taken of their communications should authenticate them with their names, not necessarily for publication.

Authors desiring REPRINTS of their articles published in the *British Medical Journal* must communicate with the Secretary, B.M.A. House, Tavistock Square, W.C.1, on receipt of proofs. Authors over-seas should indicate on MSS. if reprints are required, as proofs are not sent abroad.

All communications with reference to ADVERTISEMENTS should be addressed to the Advertisement Manager. Orders for copies of the *Journal* and communications with reference to subscriptions should be addressed to the Secretary, B.M.A. House, Tavistock Square, W.C.1.

The TELEPHONE NUMBER of the British Medical Association and the *British Medical Journal* is EUSTON 2111.

The TELEGRAPHIC ADDRESSES are
EDITOR OF THE *BRITISH MEDICAL JOURNAL*, *Aitiology Westcent, London.*
SECRETARY, *Medisecra Westcent, London.*

The address of the B.M.A. Scottish Office is 7, Drumsheugh Gardens, Edinburgh (telegrams: *Associate, Edinburgh;* telephone: 24361 Edinburgh), and of the Office of the Irish Free State Medical Union (I.M.A. and B.M.A.), 18, Kildare Street, Dublin (telegrams: *Bacillus, Dublin;* telephone 62550 Dublin).

QUERIES AND ANSWERS

Ultra-violet Irradiation

"ULTRA-VIOLET" writes: I would be much obliged for information as to the present position of ultra-violet medication for people who are in tolerably normal health, but who for one reason or another are run down, overworked, etc. Is it likely to be of any assistance to them, and is there any objection to its frequent use over a period of years?

Vaccine Reactions

Dr. C. M. HEANLEY (Hassocks, Sussex), in reply to "Rural G.P." (*Journal*, August 14, p. 358), writes: What is meant by "persistently overdosed"? After experiments in South Africa doses of 6,000 to 7,000 millions of pneumococci at seven-day intervals were recommended as a suitable prophylactic. The trouble may be due to other organisms, perhaps in a blocked maxillary, frontal, or ethmoidal sinus, and not to the vaccine.

Cancrum Oris

Mr. G. H. PEAKE (Guildford), in reply to Dr. Hope Trant (*Journal*, July 3, p. 48), writes: I saw many cases of cancrum oris among the natives of Madagascar, and treated them by burning the base of the ulcerated surface very thoroughly with fuming nitric acid. My first case was that of a child aged 2. The sore, which began on the inside of the upper lip (left side), had perforated right through it; it did not appear to be painful, as the child was suckling well. There was a sanious and stinking discharge. Under light anaesthesia the wound was thoroughly cauterized with pure nitric acid. Four days later this was repeated, as the sore had spread. Five days after that a large piece of the superior maxilla came away with several teeth. The cavity was again thoroughly burnt. The wound was washed several times daily with lotio hydrarg. perchlor., 1 in 4,000, and stimulants were given. Three days later the wound had much improved and there was no sign of any further spread, but a new focus had started on the inner side of the right upper lip. The whole was cauterized again. This application checked the disease and the sore healed rapidly. Though the hole in the lip (and upper jaw) had been very extensive, the lip contracted and almost closed, leaving very little deformity. Out of seven subsequent cases treated in the same way one patient died. In this case the condition started in the left ear and the child died of exhaustion with cerebral symptoms.

LETTERS, NOTES, ETC.

Dangers of Glass Ampoules

Lieut.-Colonel H. H. KING, C.I.E., I.M.S. (ret.), writes: While in charge of a laboratory in India I noticed that when ampoules in which a vacuum had been created were filled with vaccine the inrush of vaccine carried in small particles of glass from the breakage of the stem. On examination of the deposit from several ampoules many of the glass particles were found to be minute enough to pass through an ordinary small hypodermic needle, and they could thus be injected into a patient along with the vaccine. If there are any manufacturing or other laboratories using this method of filling ampoules they should know of this danger. I notice that some firms are putting out ampoules containing two solutions separated by a glass partition that has to be broken before the two substances are mixed. Has the possibility of the dissemination of small splinters of glass in these ampoules at the time of breakage been examined?

An Unusual Treatment

"BEN TROVATO, M.D.," writes: In an entertaining book of naval reminiscences entitled *My Mis-spent Youth*, I came across the following passage: "One of the younger midshipmen who had a rather high-pitched voice, was observed not to be developing properly. A special drill was invented. He was stood on the end of the gun-room table, facing outwards and quite stiff, and then his feet were knocked forward. He fell three or four feet with a jarring thud. A few weeks of this treatment had the desired effect." I should like to know whether this inexpensive but slightly barbaric treatment of the undescended testicle is one more proof of the resourcefulness of the Royal Navy, or whether it is traditionally practised by other communities to whom gonadropic hormones are not available.

Holidays for Factory Girls

We have received the following appeal, signed by the Countess of Sandwich, Miss Lilian Braithwaite, Miss May Wynne, Mrs. Mary M. Paget, the Bishop of London, the Chief Rabbi, and Lady Loch, on behalf of the Factory Girls' Holiday Fund. "Will you allow us to make to your readers an urgent appeal for the Factory Girls' Country Holiday Fund? It has helped hundreds of the poorest of London's girls and women to go away for the August Bank Holiday week, the only clear week they could get in the whole year. Many more are hoping to get away during the next weeks; but at present our funds are exhausted. A large number of the girls sent away are hardly more than big growing children, having recently left school for work in factories and warehouses. This summer holiday means even more than a health-giving change of air and surroundings. Boarded with kindly cottagers living in their own well-ordered little houses, the girls and women exchange with country folk experiences which make life fuller and more complete. Those from London gain, too, a new interest in nature—in the cultivation of flowers, and fruit, and vegetables, and in the care of animals. Think what this means to people who live for the rest of the year in crowded dwellings and stuffy streets, often far away from parks and large open spaces! A summer holiday means much to most of us. To them it means a benefit which is almost indescribable. Will your readers help us to save these girls from bitter disappointment? Gifts will be thankfully received and acknowledged by the honorary treasurer, Mrs. Slater, Lowood, Hindhead, Surrey, or by Miss Canney, 75, Lamb's Conduit Street, London, W.C.1."

Corrigenda

In the paragraph on Messrs. Hewlett's preparation of para-aminobenzenesulphonamide at page 217 of the *Journal* of July 31 the name of this product was given as "P.B.A.S." This should have read "P.A.B.S."

Dr. L. G. MILLAR PAGE writes: In my letter on prominal in epilepsy (*Journal*, August 21, p. 393) I said: "Dr. Millman has reported a reduction of one-third in the number of fits in a year under prominal. . . ." This should have read: "Dr. Millman has reported a reduction *to* one-third in the number of fits. . . ." Or, more correctly, to quote Dr. Millman, "The total number of fits under prominal treatment is shown to be approximately one-third of the number during a similar period under luminal therapy."